FUTURE OF GENERAL AND COMMUTER AVIATION TECHNOLOGY AND TRADE

JOINT HEARING

BEFORE THE

SUBCOMMITTEE ON TRANSPORTATION,
AVIATION AND MATERIALS

OF THE

COMMITTEE ON
SCIENCE AND TECHNOLOGY
U.S. HOUSE OF REPRESENTATIVES

AND THE

SUBCOMMITTEE ON AVIATION

OF THE

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SCIENCE, AND TRANSPORTATION
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FUTURE OF GENERAL AND COMMUTER AVIATION TECHNOLOGY AND TRADE

THURSDAY, AUGUST 27, 1981

U.S. House of Representatives, Committee on Science and Technology, Subcommittee on Transportation, Aviation, and Materials; U.S. Senate, Committee on Commerce, Science, and Transportation, Subcommittee on Aviation,

Wichita, Kans.

The subcommittees met, pursuant to notice, at 9 a.m., in City Hall, Wichita, Kans., Hon. Dan Glickman and Hon. Nancy Kassebaum (who chair the subcommittees) presiding.

Senator Kassebaum. The hearing will come to order.

First I would like to express my appreciation to Dan for his initiative in suggesting this important hearing. And I would also like to express a special thanks to the distinguished panelists and witnesses who are testifying today.

It is an important hearing, not just for what we will be telling each other, because that is a bit like preaching to the choir. We know our own strengths and weaknesses. But what is more important is what we will be telling the Nation about the future of general aviation.

I have had a concern for some time, and I think it is shared, that we are not making our voices heard in the aviation community in Washington regarding some of the important decisions there that need to be made by policymakers about the importance of general aviation to the overall health of the Nation's economy.

The current problems of the auto industry provide a vivid example of what can happen if we aren't effective in responding to the loss of the competitive edge in aviation. We need to emphasize that 960,000 employees are involved in aviation manufacturing in this country, and through their efforts the aviation industry contributes $13.3 billion to our foreign trade balance.

We need to dispel the attitude held by some at the Office of Management and Budget that when we talk about general aviation we are talking about millionaires who just fly for their own pleasure. We must realize that we are risking the general aviation industry—and the losses that can accrue through a ripple effect throughout the economy—if we continue to operate under the illusion that this is the only type of business that comes in general aviation, and we will lose this if we drastically raise fuel prices.

I know there is probably no need to repeat this here because we certainly all recognize it. But we can't over-emphasize it enough. General aviation means jobs, not just jobs building airplanes but also jobs made possible by the expansion of production planes can bring about.

I think it is interesting to know that 30 years ago more than half of the Nation's manufacturing plants were located in cities with populations of over 100,000. Since 1975, over 1,000 new plants have been located in small communities, often far from the Nation's principal manufacturing, distribution and communication centers.

Commercial air service to these communities is frequently nonexistent. However, general aviation makes it possible for business to locate facilities in these more remote areas. Corporations have seen that they can use general aviation as a tool to disperse industry, creating jobs in all parts of the country. This mobility and flexibility is important to modern business.

Corporations look at business aircraft as another piece of capital equipment, another tool to make their businesses more profitable. Take this tool away and business is hurt. And if we tax jet fuel at 65 cents a gallon, we will take it away. We need to do some educating.

I made many similar comments in a speech to the Aero Club in Washington in March. But again, that is a bit like preaching to the choir. We need to expand our audience so there is a far better understanding of the problems that face our industry in the future. We need to carefully assess our programs, prune what isn't working and strengthen those that appear to be helpful.

We must foster an attitude of cooperation between Government and the aviation industry, a recogition of their problems, and a willingness to help when that can be done with as little Government meddling as possible.

We need to get the State Department to take foreign availability into account when they assess aircraft sales to countries where a license is required. Our Government needs to stand up to other countries who freely export their products into the United States, and yet erect barriers to the import of American manufactured aircraft.

It isn't only true just in the aircraft industry. We must find ways of dealing effectively with foreign credit subsidization. And perhaps the largest cloud over all business right now is high interest rates. This again isn't just true with aviation manufacturing.

Certainly, all is not gloom and doom. American still has the best aviation industry in the world. Given our new administration's overall attitude toward business, I see an excellent chance for succeeding in the task of keeping America No. 1 in aviation.

This hearing will do much to further this goal.

Thank you.

Mr. GLICKMAN. Thank you, Nancy.

First of all, I would like to thank the city commission as well as the staffs of both myself and Senator Kassebaum for their help in setting up these hearings. I am proud to participate with Nancy in these hearings, reexamining the proper Government role in aviation. I think it's useful to focus on key issues of technology and trade as they relate to general and commuter aviation.

Historically, this country has led the world in aviation. From the first flight of the Wright Brothers to the successful flight of the Space Shuttle, American aviation has been the leader.

This Nation's aviation industry has blossomed to the point where it not only supplies our own aeronautical needs, but also those of most of the world. In fact, the export of airplanes and aviation equipment is the largest single positive industrial contributor to our balance of trade.

I am proud that Wichita and Kansas play such a major role in this important industry.

Largely due to its advanced technology and success in the international marketplace, the aviation industry has had an extremely favorable impact on the American economy. As Nancy said, millions of Americans earn their livelihood directly or indirectly due to the success of American aviation.

Yet, in spite of its past success and proven importance, our aviation industry may be facing severe problems. The NASA aeronautics research and development budget, which has been declining for years now, continues to shrink at an escalating rate at the same time that European and Japanese research and development budgets are increasing dramatically. In fact, I have heard that there is some support within the administration to end Federal support for aeronautical R. & D.

The aviation industry faces proposals to sharply increase aviation taxes in the next few years, despite the fact that the airport and airway trust fund currently has a surplus of over $5 billion.

American manufacturers are faced with new threats from foreign competition, some of which have been aided directly or indirectly by policies in our own country.

There have been cuts in the funding for the Eximbank, despite the recent report which concluded that the Government gains more than $9 in tax revenues for every $1 of interest subsidy incurred by the Export-Import Bank.

Clearly, we must either find a way to make the necessary investment and public policy changes to maintain our lead in aviation, or we shall surely fall behind. If we are to avoid allowing the aviation industry going the way of the American automobile industry, we must implement policies which will continue America's leadership in aeronautical technology and support the export of American made airplanes and aviation equipment.

Thank you.

Senator KASSEBAUM. Thank you.

Congressman Williams, will you please come forward?

It is a pleasure to welcome Congressman Lyle Williams from Ohio.

Do you have anyone else?

Mr. WILLIAMS. I have two other parties I would like to have join me, Mr. Feher and Mr. Crabtree.

Senator KASSEBAUM. We would also like to welcome at this time Mr. Kornel Feher, Commuter Aircraft Corp., Youngstown, Ohio, and Mr. Norman Crabtree, deputy director of aviation, State of Ohio.

STATEMENT OF HON. LYLE WILLIAMS, A REPRESENTATIVE IN CONGRESS FROM THE STATE OF OHIO; ACCOMPANIED BY KORNEL FEHER, COMMUTER AIRCRAFT CORP., YOUNGSTOWN, OHIO, AND NORMAN CRABTREE, DEPUTY DIRECTOR OF AVIATION, STATE OF OHIO

Mr. WILLIAMS. First of all, I would like to express my appreciation to members of the subcommittee for the invitation to appear and, hopefully, bring some good news concerning the thrust of this committee hearing. The good news being that the city of Youngstown, Ohio, which has suffered tremendously in the past 4 or 5 years because of the turn in the economy and the closing of the steel mills, the major industry in the community at the time, has now taken the lead in developing a commuter aircraft that is greatly needed in this country because of some things that have happened with the deregulation of airlines.

The gentlemen that have joined me this morning will talk in more technical terms as to the involvement of the State of Ohio, Mr. Feher will give technical data as to how this came about in the community of Youngstown, Ohio.

As you may be aware, the Commuter Aircraft Corp., as it is known, is building an assembly plant in Youngstown, as I have indicated. Plans for the construction of this plant go back approximately 2½ years, and the official groundbreaking is scheduled for September 25 of this year.

We invite both of you to attend that. It is going to be a very exciting event for Youngstown as well as this Nation. The plant will be completed some time in August of 1982. The first plane will roll off the line in February of 1984. We hope to meet those schedules as near as possible.

Commuter Aircraft Corp. was able to begin this project because it was able to receive assistance from the Federal, State and local governments. The city of Warren, Ohio, has secured an urban development action grant which will be used for site preparation by CAC.

CAC has also received $10 million in loans from local financial institutions for the construction of the plant. These loans are backed by a 40-percent guarantee from the State of Ohio, which I am sure Mr. Crabtree will go into further detail about.

Finally, CAC has obtained a $38 million loan guarantee from the Economic Development Administration. CAC also raised substantial moneys from private investors to complete their financing to this date. To my knowledge, this will be the first new commuter type aircraft to be produced in the United States in the last 20 years.

Once CAC is rolling planes off its lines it will directly compete with De Havilland in Canada and aircraft made in other parts of the world. It will not face any major competition in the United States.

In your letter of invitation dated July 24, 1981, one of the questions you addressed to me was: How can the Government assist traditional private enterprise efforts in aviation without assuming their role or diminishing healthy competitive activities?

My answer to that question today is that Government cannot, although I would like to qualify that response somewhat. As you can tell from my testimony thus far, CAC will come into being as a result of assistance from various Government agencies such as EDA, HUD, UDAG, the State of Ohio with the Ohio Development Financing Commission.

Further it is fair to say that without EDA and the loan guarantee we were able to obtain, the CAC project would still be on the shelf. With the recent budget cuts which we in Congress enacted, EDA will be severely limited in fiscal year 1982 and zero funded in fiscal year 1983. And there will be no replacement for EDA.

Given current high interest rates and the amount of capital necessary to start a project like CAC's, I can see no logical reason for the private sector to be looking at such a project at present absent those guarantees that CAC has from the Federal Government.

While the tax cuts we have enacted are beneficial to business in terms of fast depreciation and R. & D. credits, I don't believe they will be of any help to a new venture. They will, on the other hand, be very helpful to companies already in business, and I certainly support that.

Given the amount of capital needed to start an enterprise such as CAC, a manufacturing firm, or a division, and the current high cost of money, I do not not foresee any major commitments by existing firms for the next 2 or 3 years despite the tax cuts. This will result, I believe, in CAC having no major domestic competition prior to 1986 at the earliest.

Since we have deregulated the airline industry, there has been a reduction of services to small- and medium-size airports. This reduction of services has imposed hardships and inconveniences on many individuals and businesses.

I believe that the Government has an obligation to see to it that those individuals and businesses are given adequate and reliable air service, and that certainly is why you are having this hearing.

I believe that this obligation can be met by encouraging and assisting the commuter aviation industry. Given the current philosophy prevailing in the administration and a need to balance the Federal budget, I am not sure what form the aforementioned encouragement and assistance should take. But I believe it's an issue which we in Congress must address.

Again, I want to thank you very, very much for asking my participation in this hearing, and I would like to now, if the committee does not object, ask to turn this over to the other people to tell you more technical information.

Senator **KASSEBAUM**. Thank you.

Mr. **GLICKMAN**. Thank you.

Senator **KASSEBAUM**. Mr. Feher?

Mr. **FEHER**. I would like to amplify Congressman Williams' statement with regard to this unique opportunity.

CAC is a U.S. company that has made a commitment 2 years ago to enter this market. We feel that with U.S. technological superiority we can build an airplane that will be successful in future markets. The first transport category airplane that has been built by a new company since World War II.

The challenge is enormous. We all realize that. At the same time, we know that we have an opportunity created by deregulation, but perhaps even more by the escalation in fuel prices. These two factors, deregulation and the escalation of fuel prices, have created this market, the market that exists today.

I think we are all aware that foreign companies are taking advantage of the market opportunity and certainly have a jump on our industry. I would also like to call this committee's attention to the fact that in the commuter market, the commuter need is now going to a much higher payload airplane than it was originally thought or market studies had indicated.

I think the future need is beyond 30-passenger airplanes. I believe the commuter nomenclature is somewhat misleading. We have gone beyond that point where we can simply call these airplanes commuter airplanes. No doubt there is a need for 25- and 30-passenger airplanes, but much larger is the need for 40-, 50-, and 60-passenger planes.

The commuter now needs these larger airplanes on their higher density routes. Major airlines, United, American, TWA, and all the others have abandoned some of their shorter routes. I think we can see in the last few weeks an example of that, expecially since the air traffic controllers' strike.

Since a lot of these less profitable routes are being abandoned very quickly by the airlines, commuter airlines with these new airplanes will be able to serve profitably some of these routes that have high densities over short hauls. I think the commuters will need a much larger, new generation airplane.

All the foreign entries that you see represent some degree of compromise to the actual need. They are building airplanes that are not pressurized. They are building airplanes that in most cases do not represent current state of the art. These airplanes on the market have had their start in the early 1960's.

As the committee is very well aware, we have had a regulatory impediment in this country, CAB part 298; 298 has simply limited commuter operators to 30 passengers, 7,500 pounds of maximum payload capability. It did allow foreign competitors to build airplanes at higher payloads, ignoring our regulatory impediment.

In 1978, as part of the Deregulation Act, CAB has amended its regulation. It now allows 60 passengers or 18,000 pounds maximum payload. We have perhaps taken a beating in this first round.

Our company represents the first major effort in the United States to fill this market window and take the market opportunity that exists today. Deregulation and escalation of fuel prices that I mentioned earlier is giving us that opportunity.

We have been working at this project for the last 2½ years. We feel that we have a superior design that we intend to put into production. I believe we have most of the hurdles behind us. We have sufficient funds to at least to embark on this project, to certify the airplane, and to begin to satisfy the market need.

I believe that foreign manufacturers with their airplanes will take a significant sector of this market initially. But once we have built an airplane, once we have introduced this airplane on the market, we will be able to take our market share.

The FAA commissioned a marketing study in 1979. That study indicates that there is a market for 3,200 airplanes between the categories of 20-passenger airplanes and 60-passenger capacities. It also indicates that the market represents somewhere around $13 billion in 1979 constant dollars.

We have verified those numbers with independent consultants. I am most optimistic that that market exists and the quantity of that market is as large as the FAA study has indicated.

We are going ahead with the airplane. The State of Ohio has demonstrated its willingness to help with this project. I am fully aware that I am in Wichita, Kans., and I am fully aware that some of our potential competitors are in this area, although my understanding is that they are building a different size airplane.

We feel the State of Ohio can best provide the help that we need to launch this project. We have looked at our subcomponent manufacturers, our vendors, all the way from General Electric to Goodrich and Good Year. The capacity that exists in the State of Ohio is ample. We can build that airplane and we can build it in the State of Ohio.

Thank you.

Senator **Kassebaum**. Thank you, Mr. Feher.

Mr. Crabtree?

Mr. **Crabtree**. Thank you, Madam Senator and members of the committee.

I am here basically representing Gov. James A. Rhodes from Ohio. I might just mention, I have been in my job 23 years. I have probably been a State director longer than anybody in the United States. I took the job for a year.

But one of the reasons I am here, I really want to compliment your committee on looking at this problem, because 2 years ago when I testified before the Civil Aeronautics Board, I tried to point out the very problems that you people are dealing with today.

I asked the CAB at the time of the deregulation and pleaded with them even 3 years ago that we really must look at the third level air carrier. The word "commuter" kind of disturbs me because my mother-in-law won't get on one. She thinks that it's not safe.

Senator **Kassebaum**. You have a little educating to do in your own family.

Mr. **Crabtree**. Yes; I have. Basically, I think what we are saying here, and I am glad to see us addressing the general aviation picture, too, because we are directly involved in that. I think the interesting thing that I have seen in my 23 years, and we have learned this in Ohio, I have built 69 new airports in a short period of time.

What we found was that that is the major source of transportation. And if you are going to get new industrial development and new growth, they are not going to drive, they are not coming by rail, and they are not coming by bus. They are going to fly. So in our region, which is a very highly industrial base, we believe, as I told the Civil Aeronautics Board 3 years ago, that we have to address this problem of the short-haul air carrier.

You know, we have been spending a tremendous amount of energy and time on high-speed rail in Ohio. They get very upset with me when I tell them a good airplane will be clear to Columbus or Cincinnati before you get out of Cleveland. So I think my purpose in being here is to basically make the point on behalf of our State that we believe that this is a very, very serious problem because I have worked with the commuters over the years, 23 years.

I have seen them go into business and have a very difficult problem to make a profit because of the type of airplane. We haven't addressed this thing. Now I am very concerned because the commuters I am working with now are all flying foreign-built airplanes. That is foreign to me because I have flown everything built in Wichita for some 39 years, and it disturbs me when I see our commuters within my State all flying Brazilian-built, Spanish-built aircraft.

So I really commend this particular committee because it is exactly what I said at the time. And I am not speaking out of turn when I work with commuters; I know their financing problems. When you can go out and buy a foreign airplane at the kind of financing we have seen the last few years, our work is cut out for us.

You know, as I travel throughout the world, and it's kind of refreshing to go into Africa and see half of Wichita flying over Africa, because we have furnished and built the airplanes for the rest of the world. We can build the best airplanes in the world. But I think what I am really saying here now is we have coined a term in Ohio: The front door to your community is the airport.

You have got to be able to get in and out of there. You have got to have the flexibility that day; the corporation that is going to do business, compete and make a profit has to move with the kind of speed you do with the airplane. So we certainly support what you are doing.

It is exactly what I said at the time before the Civil Aeronautics Board: If you have deregulation, we do not have the lead time. We haven't done our work to look at the problem and fill those voids in. I know Congressman Williams is telling this morning, I have had 52 trips out of Cleveland in 4 months with the deregulation. We are slowly trying to fill that void.

But I would like to just point out that in our Industrial Financing Commission of Ohio, we are so concerned about the problems we have put a lot of State money into the project, and we have a lot of confidence that there is a market for this kind of airplane. I would be just tickled to death to see some of the European people come over here and buy a 40-passenger airplane from us because we build a better airplane.

So I would like to just kind of close by saying that we are hoping now that we will address this problem because in the State we operate a large airplane and what surprises me is that somebody is trying to buy it from us all the time for the commuter market because there isn't that kind of aircraft available for the market.

Certainly we have the technology, and it has been proven here. I hope we will look at this, because I told the Civil Aeronautics Board 3 years ago that you definitely are going to have to take some kind of leadership. The Government ought to take some kind of leadership and some kind of financial support because when you look and say, hey, this particular foreign government is going to finance an airplane for 6½ percent, and you look at our prime interest rate now, it presents a real problem.

So I certainly want to commend you and the committee and on behalf of the State of Ohio through Congressman Williams here, have some $50 million in this project. We think it has great potential.

Thank you.

Senator **Kassebaum**. Thank you very much. I appreciate your being here. You are speaking to two Representatives who I must confess are parochial in our pride of being from the air capital of the world, but welcome competition. I think it's healthy for the industry.

Mr. **Glickman**. First off, Lyle, I appreciate your being here. I would like to ask you something about your airplane.

Can you briefy tell me what you are talking about, what kind of technology, size, when you intend to begin to produce the airplane actually?

Mr. **Feher**. Congressman, I will try to summarize that to you.

We went to Paris, the Paris Air Show, a couple of months ago and made our first public announcement. The announcement read that we are going to build a 50-passenger airplane, 10,000 pound payload capacity. The airplane is a low wing airplane. The airplane has four engines, PT 6-45 Pratt and Whitney engines. The engine is certificated. The PT 6 family engines are used on 62 percent of all commuter airplanes flying today.

There is excellent support for the engine. The airplane is pressurized to 6.4 p.s.i., which means you can fly equivalent to at sea level pressure when you fly at 16,000 feet; equivalent to 8,000 altitude in the cabin when you are flying at 29,000 feet. The airplane has a cruising speed of 300 knots, capable of taking off and landing on 4,000-foot runways at sea level on a standard day.

The airplane has all the modern conveniences of today's transport category airplanes. It does have 6 foot 3 inches headroom. It has a large entry door. It has four abreast seating. It does have a 20-inch aisle. The airplane cost is $100,000 per revenue producing seat, $5 million per airplane, in 1982 constant dollars. The airplane is very competitive, at that price, with all the foreign airplanes and all the smaller domestic airplanes that are being manufactured.

To give you an idea, the Canadian Dash-7, which is probably our main competitor, has a more sophisticated wing structure, designed for the STOL market as anticipated in the early 1970's. It's an excellent competitor that gives us a good indication of what the market will be.

The Dash-7 sells for around $112,000, $118,000 per revenue producing seat. Some of the smaller ones, such as the SD-330, a nonpressurized airplane coming from Belfast, are selling for around $80,000 per revenue producing seat, so I think we are in a very comfortable position with that projected sales price.

The airplane represents current state of the art. It represents current technology. Pressurized, air-conditioned, with all the conveniences to the passengers that modern airplanes can give. If you look at the airplane, it is an airplane that will provide you with trunk line comfort and safety, but will provide you also with the economy that the engines, only turbo prop engines will assure, fuel savings in the neighborhood of 30 or 35 percent.

Senator **Kassebaum**. Thank you very much. It is a pleasure to have you here.

Mr. **Feher**. Congressman, to answer your second question related to the schedule of deliveries, we anticipate that we would start production of the airplane in the early part of 1982. We anticipate to have the first airplane flying in 1983, 18 months after the go-ahead. We anticipate having a certificated airplane, FAR part transport category airplane, in 27 months, by the first quarter of 1984.

We hope to be able to deliver the airplane in the first half of 1984, reaching maximum production rate of four airplanes per month, 48 per year, by the end of 1984.

Mr. **Glickman**. Thank you.

Senator **Kassebaum**. Thank you.

Congressman Williams, do you wish to sit with the committee?

It's a pleasure to welcome our next witness, Dr. Hans Mark, Deputy Administrator of NASA.

Mr. **Glickman**. I might mention that the last time Dr. Mark was here he was defending Kansas against Titan missile propellant leaks when he was Secretary of the Air Force. So I don't think he is quite on the spot right now as he was then.

STATEMENT OF DR. HANS MARK, DEPUTY ADMINISTRATOR, NASA

Dr. **Mark**. Thank you. I would like to remark that the circumstances under which I am here are much happier than last time, but the hospitality of this community is always so great that it is a genuine pleasure to be here again. You know that I am a Californian, and as such I live in the comfortable knowledge that California is after all the leading State—and some of us think it's a "nation"—in the aeronautics world. But, in doing my home work for this hearing I was chagrined to find out that Wichita has more aviation activities per capita than any community in California. So, I hope I will comport myself well today in the presence of my superiors. Obviously, it's a very important community for our industry and our enterprise.

Aviation is part of the mainstream of American history. It all started at Kitty Hawk on a raw December morning in 1903, and the United States has, as pointed out by the members of the committee and the witnesses here today, been the leading aeronautical nation ever since. Last year, we exported over $15 billion worth of aeronautical products. This is second only to the exports we have in agriculture. Here in Kansas you all know about agriculture; but it is an indication of how important the aviation industry is to this Nation. This leadership, ladies and gentlemen, is no accident. It is because we have built, over the years, the technical base necessary to do the work. In 1915, a far-seeing Congress inserted a provision, a rider, if you will, into the naval appropriations bill for that year which provided for the creation of a National Advisory Committee for Aeronautics [NACA]. My current employer, the National Aeronautics and Space Administration, is the successor agency to that Committee.

The heart of that bill charged the Committee to do the following thing:

> It shall be the duty of the Advisory Committee for Aeronautics to supervise and direct the scientific study of the problems of flight, with a view to their practical solution, and to determine the problems which should be experimentally attacked, and to discuss their solution and their application to practical questions.

In the very beginning the charter was do research and then apply it. Very importantly, it wasn't research alone, but research and the application. Built into the law then is the strong interaction we have had with the aeronautical industry ever since. In this very straightforward way, I think, were planted the seeds of our aeronautical superiority.

You might be amazed by the next provision in the bill. I would like to quote it for our congressional friends. It says:

> The sum of $5,000 a year, or so much thereof as may be necessary, for five years is hereby appropriated, out of any money in the Treasury not otherwise appropriated, to be immediately available, for experimental work and investigations undertaken by the Committee, clerical expenses and supplies, and necessary expenses of members of the Committee in going to, returning from, and while attending meetings of the Committee.

Now in that more innocent day, three-quarters of a century ago, it may have been possible to do something useful with $5,000. Unfortunately, today we are no longer in that happy state. Nevertheless, I was pleased that Congress in those days did recognize the importance of travel money and I trust when we come before you this next year we will be treated very well.

Mr. GLICKMAN. We promise to give you $5,000.

Dr. MARK. After inflation it might work, in 1915 dollars.

The aeronautical research program conducted by the National Aeronautics and Space Administration over the years has been oriented primarily toward the development of high performance aircraft. The orientation always has been toward aircraft that have performance characteristics necessary for military operations. The commercial consequences have been primarily in the area of fallout; that is, we have applied things we have learned in high-performance military aviation to the commercial world.

In commercial transportation, of course, you are all familiar with the fact that airplanes like the Boeing 707 are direct descendents of large jet bombers we built in the early 1950's. In fact the 707 has almost the identical airframe as the KC-135 tanker. The B-52's and KC-135's were, of course, very heavily worked on and developed in facilities such as wind tunnels, flight simulators and commuters, that belonged to the NACA then.

We now have, in NASA, a total investment of more than $3 billion in major facilities devoted to this task. Some of the witnesses today will speak to that. We are at the point where we are no longer utilizing these facilities properly because, as Congressman Glickman and Senator Kassebaum have pointed out, our appropriations for aviation have not been keeping pace with what we ought to be doing.

While we are very good in high-performance aviation, we have not done as much as I would like in other areas. There are some reasons for this. The Government is not particularly good at doing things where high technology is not the dominant question, where market pressures or economic factors are more important. The judgments that tend to be necessary to do well in those areas really don't reside in the Federal Government. On the other hand, I do believe that the funding we put into general aviation is somewhat too small. Let me talk a little bit about that and how we break it down.

Roughly speaking, in the area that we are talking about to date, commuter airlines, helicopters, executive jets and general aviation, we have had problems. Fortunately, in the area of fixed wing general aviation, where this city excels, we are still without question No. 1 in the world; but in helicopters, business jets, and particularly commuter airlines, we have lost any lead we ever had.

In fact, in the area of helicopters, we have had the lead and then lost it. In the area of business jets, we had a lead and lost it. In the area of commuter airplanes, for some reason, we never got properly started. So, these are areas in which, I think, we ought to concentrate to catch up and assume or reassume the leadership we once had.

The total NASA budget, exclusive of salaries of the people; that is, the money they get to spend on equipment, computer time, and facilities that is earmarked directly for general and commuter aviation in fiscal year 1982 is $8 million, which is not very much. It is about 3 percent of our total aeronautical budget. On the other hand, the figure is a little bit misleading because much of the work we do in our basic disciplines also has applications to general aviation. I would like to give you a breakdown, if I may, of three items that are important to general aviation and give you a figure which I believe is roughly accurate in terms of the investment we make every year in work related to general aviation.

In fiscal year 1982 we will spend about $30 million, Madam Chairman, on materials research which is exceedingly important for all of aviation, including general aviation. I would say almost all of that work is directly applicable to general aviation manufacturing. As you probably know, there are some small airplanes coming out today that will make a commitment to have the entire structure made of these new composite materials that we have been working on for 15 years. I think that work is the payoff. I would say all of that $30 million has clear applicability to general aviation.

We will spend another $30 million a year on aerodynamics in fiscal year 1982. Most of that work is devoted to high performance airplanes. So, I would judge probably only about 30 percent of that amount is applicable to general aviation and the kinds of things we are discussing. So, I add another $10 million, which raises the total amount to $48 million. We spend about $9 million a year on avionics and flight controls. My estimate is about half of that is somewhat applicable to general aviation, especially component work, where one makes smaller and more efficient electronic components because that is universally applicable. So, let's add another $4.5 million or so. In round figures, it is approximately $50 million per year for work that is applicable to the research, technology and development problems of general aviation.

If you add the salaries of the people we have that roughly doubles the amount. Roughly speaking, NASA puts something of the order of $100 million a year into work that is relevant and applicable to general aviation, commuter aviation and related topics.

We have another $46 million or so a year we put into helicopters. This is approximately the total budget per year that the National Aeronautics and Space Administration devotes to this kind of work.

I don't think that that is enough. That is a personal opinion, not one which is yet part of our budget submission. I hope I can influence our Administration to make it part of our budget submission. I hope very much that we can increase this work, because I think it's terribly important for the ultimate economic results for which we are looking. I am firmly convinced that we should do more. Let me very briefly say what we should be doing.

Primarily, the work we do in general aviation is devoted to safety in flight and to efficiency; that is, in making safer airplanes that are more efficient. As for safety in flight, we have a very large program in crash survivability. We also have programs in advanced avionics that will increase safety by reducing the workload of single pilots during instrument flight.

In the efficiency area, we have propeller research underway on the new turboprop. The manufacturers Mr. Feher was talking about will take advantage of this. Incidentally, I share his confidence that we can build the best commuter plane in the world. In fact, it's a fortunate circumstance that the research center doing the work in propeller research happens to be in Cleveland. So, Mr. Williams, I hope you will make that connection because work is being done there, right now, and we ought to put whatever is applicable on the new airplanes that you are thinking about.

I would like to submit for the record, if I may, Madam Chairman, two items. One is a summary of the general aviation work and things related to it that we do. The other item is a report on general aviation that was recently issued by the Committee of the National Academy of Engineering outlining the research and technology recommendations that we should be pursuing.

I strongly endorse this plan. I hope, again, to be able to report to you when we come up for our authorizations early next spring that I have been able to persuade the administration to adopt this plan.

The key recommendation in the report is that we do need an overall strategic plan for research and development in general aviation that should be developed with the cooperation of the industry. The report states rather optimistically that this plan should be ready for the fiscal year 1982 budget cycle. I don't think we can quite do that, but I would like to urge very strongly that we do get started. I am here to offer the collaboration of our agency with the industry in any and all ways that seem to be reasonable to us.

Madam Chairman, I very much appreciate the opportunity to be here and will answer any questions you may have.

[The prepared statement of Dr. Mark follows:]

Statement of

Dr. Hans Mark
Deputy Administrator

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

before the

Subcommittee on Aviation
Committee on Commerce, Science and Transportation
United States Senate

and the

Subcommittee on Transportation, Aviation and Materials
Committee on Science and Technology
House of Representatives

Madame Chairman, Mr. Chairman, and Members of the Subcommittees:

It is a great pleasure indeed for me to appear in Wichita today before this distinguished joint session of the Committees of the Senate and the House of Representatives that deal with aviation. As you may know, I am a Californian, and so I lived for many years in the comfortable knowledge that California, after all, was the leading State, nay "nation," in the world in matters aeronautical. Imagine my chagrin, then, when I found out that Wichita exceeds any community in California in per capita involvement in aviation! All I can do Madame Chairman and Mr. Chairman is to acknowledge the superiority of this community and to express the fervent hope that I will make a good impression when my superiors here sit in judgment over me.

Aviation is part of the mainstream of American history. It all started at Kitty Hawk on a raw December morning in 1903, and the United States has been the leading aeronautical nation ever since. Last year we exported over $15 billion worth of aeronautical products. For the first time, aviation products exceeded agricultural products as our biggest single net export item--and Kansas must know, of all people, how important agricultural exports are to our economy. It is no accident that we lead the world in aviation. In the spring of 1915, a far-seeing Congress inserted a provision (today we would call it a "rider") in the Naval Appropriations Bill for that year which established a National Advisory Committee for Aeronautics (NACA). You all know that my current employer, the National Aeronautics and Space Administration (NASA), is the successor agency to that committee. In that bill the Congress ordered that "it shall be the duty of the Advisory Committee to supervise and direct the scientific study of the problems of flight, with a view to their practical solution and to determine the problems which should be experimentally attacked and to discuss their solution and their application to practical questions." In this simple and straightforward provision were planted the seeds of our aeronautical superiority today. You might also be interested in the next provision of the bill which said that "the sum of $5,000 a year, or so much thereof as may be necessary, for five years is hereby appropriated, out of any money in the Treasury not otherwise appropriated, to be immediately, available, for experimental work and investigations undertaken by the committee, clerical expenses and supplies, and necessary expenses of members of the committee in going to, returning from, and while attending meetings of the committee." Now in that more innocent day, three-quarters of a century ago, it may have been possible to do something useful with $5,000. However, inflation has since made that completely impossible. Nevertheless, I was pleased to note that the Congress did recognize the importance of travel funds for the members of the committee and I fervently hope that you will go easy on our travel appropriations request when we come before you to justify our budgets next spring!

The aeronautical research program conducted by the National Aeronautics and Space Administration over the years has been oriented primarily toward the development of high performance aircraft. This work has had the consequence that 75% of all commercial aircraft in the non-communist world are of American manufacture. There is no question that this fact is something which enhances the prestige of the United States abroad. It is also true, and also a consequence of NASA's work, that American military aircraft are the best in the world--as the events of Tuesday a week ago over the Mediterranean once again confirmed. We have achieved this superiority because NASA has, over the years, maintained the best aeronautical research establishment in the world. We have facilities in place (wind tunnels, flight simulators, computers, and experimental aircraft) that have a replacement value of well over $3 billion. This enormous investment has been made possible by farsighted Congresses over the years. I hope very much that people will continue to recognize that our superiority is due directly to this investment. In addition to the facilities I have mentioned, NASA has also maintained an exceedingly competent research and development staff. In the last analysis, it is the intellectual capital that these people represent which will ensure our continuing superiority overall in aviation.

While we are very good in aviation, there are some sectors in which we have not done as well as in others. These sectors tend to be the ones in which economic considerations, markets, and other non-technical factors tend to dominate things. Our foreign competitors have made heavy inroads in markets concerned with commuter aviation, executive jets and helicopters. Fortunately, in the field of fixed-wing general aviation, in which this city excels, we are still in relatively good shape. The trouble is that the government is not particularly good in judging economic and market factors and is thus not in a very good position to help in those branches of aviation where high technology is not the dominant factor. Nevertheless, there are some technical things that can be done, and I would like to expand on some of these topics now.

The total budget in NASA devoted to research and development in matters related directly to general and commuter aviation is approximately $8 million per year. This, of course, is very small compared to other things we are doing, but it is, nevertheless, very important. It is also true, of course, that the remainder of our aeronautical research budget has some bearing on general aviation and therefore the figure I have quoted might be misleading. The primary emphasis in our aeronautical work related to general aviation has been placed in two areas: safety and efficiency of flight. In the field of safety, we have programs in crash survivability, stall spin prevention, and general aviation avionics. In all of these areas we work closely with the Federal Aviation Administration to help that agency in its responsibility for developing certification critieria and safety regulations. In the area related to efficiency of flight, we work in aerodynamics (laminar flow airfoils, for example), more efficient engines and propellors, and lightweight materials. All of these things are important, and they utimately do have very profitable commercial applications. Many of you here are connected with the general aviation industry and you know that when you design a new airplane you do not use NACA and NASA technical reports and computer programs in the design process.

I am firmly convinced that NASA can, and should, do more to enhance our Nation's position in commuter aviation and in general aviation. Madame Chairman and Mr. Chairman, for the record I am submitting a summary of NASA's ongoing programs in this area. I would like also to submit for the record a document recently released by the Aeronautics and Space Engineering Board of the National Academy of Engineering titled "General Aviation," which details what needs to be done. One of the recommendations made by the Board reads as follows: "A strategic plan needs to be developed by NASA in association with the general aviation industry and implemented as soon as possible, certainly in time for the 1982 budget cycle." This plan is outlined in the remainder of the document and details what work NASA should do. I heartily concur with this recommendation, and I would like to invite the members of the industry present here today to join with us in developing such a plan.

Madame Chairman and Mr. Chairman, I would once again like to express my thanks for the opportunity that you have given me to be here. I will now be pleased to answer any questions that you might have.

Senator **Kassebaum**. Thank you very much, Dr. Mark.

I have a couple to start out with. In speaking of this strategic plan, and like I said, I have read the part of your proposal regarding general aviation. I think it is well worth reading the recommendations for all of us. It is very well stated. But in designing a strategic plan, how do you propose for NASA to reorder its priorities? What suggestions do you have in the way of targeting money and efforts and research for general aviation projects?

By the way, we will insert into the record the materials you requested.

[The information follows:]

SUMMARY OF THE NASA
GENERAL AVIATION AND COMMUTER AIRCRAFT
RESEARCH AND TECHNOLOGY PROGRAM

A SUPPLEMENT TO THE STATEMENT OF
DR. HANS MARK, DEPUTY ADMINISTRATOR,
NATIONAL AERONAUTICS AND SPACE ADMINISTRATION
BEFORE THE
SUBCOMMITTEE ON AVIATION, COMMITTEE ON COMMERCE
SCIENCE AND TRANSPORTATION
UNITED STATES SENATE
AND
SUBCOMMITTEE ON TRANSPORTATION, AVIATION, AND MATERIALS
COMMITTEE ON SCIENCE AND TECHNOLOGY
HOUSE OF REPRESENTATIVES
HEARING ON
THE FUTURE OF GENERAL AVIATION AND COMMUTER AIRLINES
WICHITA, KANSAS
AUGUST 27, 1981

Summary of the NASA General Aviation and Commuter Aircraft Research and Technology Program

NASA's objective in aeronautics is to generate the technology required to permit the development and operation of superior U.S. military and civil aircraft. The accomplishment of this objective requires the establishment and maintenance of highly specialized research facilities and expertise, the conduct of fundamental research in the technical disciplines which are common to all aeronautical vehicles, and the conduct of research specifically directed at the needs, and the opportunities for improvement, of four classes of aircraft. The classes are high-speed (primarily military) aircraft, transport aircraft, rotorcraft, and general aviation.

General aviation embraces a broad variety of aircraft ranging from the small training and personal aircraft to the larger business jets and commuter transports. It is a very important segment of U.S. aviation in terms of fleet size, services provided, export sales, employment, and overall contribution to the U.S. economy. It is growing rapidly, and is becoming an area of increasingly intense worldwide competition, particularly for the larger aircraft.

NASA's general aviation program has had specific definition and support since the mid-1970's. It was then formulated with the guidance of the general aviation industry and user community to deal with specific technical problems that had become evident, and to try to take advantage of opportunities for potential advances in technology. The general aviation area of concern has recently been broadened to include small commuter transport aircraft due to many similarities in design and manufacture.

Primary technical objectives of the program are increased energy efficiency and safety, with secondary emphasis on increased utility or usefulness, public acceptance, cost reduction and profitability. An underlying motivation for the program is to assist U.S. industry in achieving the strong technology base needed to produce the kind of aircraft the country needs in the future, and to maintain its competitive position in the face of increasingly aggressive and technically competent foreign competition.

In planning our research and technology activities, we organize our efforts to get the maximum possible yield from the available resources by eliminating unnecessary duplication. To this end, in our general aviation program, we place primary emphasis on those aspects of the technology which are not only critical, but also unique to this class of aircraft. For example, very little of the general aviation program itself is devoted to business jets, since much of the technology being generated in the conventional transport programs is directly applicable to the business jets. On the other hand, the technology needs of the smaller commuter transports are not wholly served either in the transport programs or in the general aviation programs in the past, so the general aviation program is currently being modified to include specifically the technology for these aircraft.

In addition to research directed specifically to general aviation and commuters, a number of other activities comprising NASA's total aeronautics program also have relevance. These include elements of basic research in each technical discipline, computational methods development, and certain technology evolution and demonstrations specifically addressed to other classes of aircraft but still applicable in some degree to general aviation and commuters.

The annual funding level of the research specifically directed to general aviation and commuters has ranged from about 2 to 5 percent of NASA's aeronautics budget. In dollars, the directed general aviation/commuter budget in FY 1981 is $8.8 million. The fraction of the rest of the aeronautics budget that is also relevent to general aviation/commuters is difficult to determine accurately, but it is estimated to approach an additional 50 percent of the directed amount.

More than half of the general aviation funding is used by our NASA Research Centers to fund research in universities and industry. The rest goes to support research conducted at the Centers. In addition to the dollar resources, approximately 175 man-years of research and direct support effort are also applied to the general aviation program by NASA personnel. Except for the propulsion-oriented activities at the Lewis Research Center, the program is conducted by the Langley Research Center, with minor participation of the Ames Research Center.

There are eight principal areas of research specific to the general aviation/commuter vehicle class, as follows.

. Aerodynamics and Flight Dynamics. A major thrust is stall/spin research directed to the understanding of this important phenomenon and to the development of math models and analytical techniques for predicting aircraft behavior and for designing desired characteristics. A second objective in aerodynamics and flight dynamics is research on natural laminar flow airfoils using modern design methods and experimentation methods. The objective of the work is improved lift and drag characteristics, decreased sensitivity to transition due to insects, dirt and surface irregularities, and acceptable airfoil characteristics in the event of transition. A third objective is advanced configuration research aimed at reducing interference drag and improving the handling qualities of advanced aircraft concepts such as canard and three-surface configurations with aft-mounted engines and propellers.

Internal Combustion Engine Research. Near-term improvement research on general aviation internal combustion engines is being conducted to develop techniques for fuel consumption reduction with minimal changes made to the engines. Longer range objectives are concerned with advanced internal combustion engine cycles and configurations including lightweight diesels, rotary combustion, and spark-ignited reciprocating concepts, all of which have been logical candidates for advanced general aviation and small commuter engines capable of achieving up to 50 percent reductions in fuel consumption and capable of burning aviation jet fuel as the primary fuel and other fuels as alternatives. Because of its near-term and long-term application potential, turbosupercharger research is also being conducted to achieve ways to increase engine cycle efficiency through better supercharger efficiency and matching. Efficient high pressure ratio superchargers are essential to the development of all advanced engine types. Our future plans for advanced engine research include program augmentation to accelerate the technology base for one or more of these more advanced engines to enable the industry to launch development programs later in this decade.

Propeller Research. The objectives of this research are increased efficiency, reduced noise, lower weight and better structural properties for general aviation and commuter propellers. The Lewis Research Center is the lead NASA center with the Langley Research Center supporting in the noise and structures area. This propeller research lies outside the speed and power ranges being considered in NASA's high-speed turboprop program.

Structural Crash Dynamics. This research has as its primary goal increased survivability. Its objectives are the development of analytical and design methods needed to reduce crash impact loads on aircraft occupants. Improved, load-limiting seats and personnel restraint systems, and energy absorbing fuselage subfloors are included in this Langley Research Center program. Analytical methods and computer codes are being developed to predict structural behavior during crash impacts, taking into consideration the large-deflection and plastic deformation nonlinearities involved. Many instrumented full-scale experiments (crash testing) and laboratory tests of structural assemblies have been conducted during the development and verification of the codes. Much of the program has involved the cooperation of the FAA as well as aircraft manufacturers.

Low Cost Composite Structure. Size, loading intensities and cost bases of high performance business aircraft and larger commuters approach those of large transports, and could therefore encourage the use of similar materials and fabrication methods for composites. Such techniques, however, have been judged inappropriate and too costly for smaller general aviation aircraft. New lower cost, less technically demanding materials and processes are desired to bring about the low weight and smooth surface finishes needed for increased fuel efficiency and durability. Research directed to these objectives is beginning at the Langley Research Center.

Controls Guidance and Avionics. Particularly attractive to general aviation, because of its simplicity and low cost potential, is the sensor display and device research at Langley which investigates the feasibility of advanced concepts. Presently under investigation are a unique true airspeed sensor, and gyroless rate and heading reference sensors for simple autopilot applications. Each of these devices is currently being evaluated by industry. Several electronic cathode ray tube display concepts derived from the NASA Terminal Configured Vehicle program are included in a study of the value of advanced instrument symbology for general aviation, and an electronic attitude display indicator for general aviation is being flight tested. The Demonstration Advanced Avionics System technology program for general aviation at Ames is exploring the usefulness of advanced integrated guidance and flight control system concepts based on digital techniques and devices. The contractor program with Honeywell and King Radio is nearing completion, and the system, installed in a Cessna 402B aircraft, is ready for flight test. During FY 1982, this aircraft will be transferred from Ames to Langley for continued research in this field. Advanced digital autopilot research at Langley utilizes digital electronic concepts and modern control system theory. It is concentrating on simplified systems design analysis procedures which would enable industry to reduce the complexity, and potentially the cost of general aviation autopilots.

Human Factors Research. An important activity in this field is an evaluation of single pilot activities during instrument flight rules (IFR) operations which unnecessarily complicate and increase pilot workload, cause performance deterioration, and perhaps contribute to flight hazards or accidents. Research in this area also includes simulator studies to evaluate advanced cockpit controls and displays suitable for general aviation. Some of the innovative display concepts include simplified three-dimensional perspective flight path guidance techniques and electronic map concepts. Another activity is the conduct of trade-off studies to determine the relative advantages of advanced information display formats in contrast to different degrees of automatic flight controls. Electronic speech synthesis, speech recognition and control action during single pilot IFR operations are also being evaluated. In another part of the research, methods are being studied for obtaining and disseminating better real-time weather information for use enroute. Improved procedural changes and applications of advanced air traffic control concepts (such as the Discrete Address Beacon System and Cockpit Display of Traffic Information systems) are also being assessed in regards to their relevance to general aviation.

Agricultural Aerial Applications Research. The objectives of this research are to improve the accuracy, safety and productivity of aerial dispersal systems used for agricultural and other purposes. The interactions of dispersants and airplane wake are being studied, and computer codes for analyzing dispersant distribution in aircraft wakes and resulting patterns on foliage or ground are being developed for use by designers of aerial application equipment. This work is being phased out in FY 82 with initial verification of the first interaction codes.

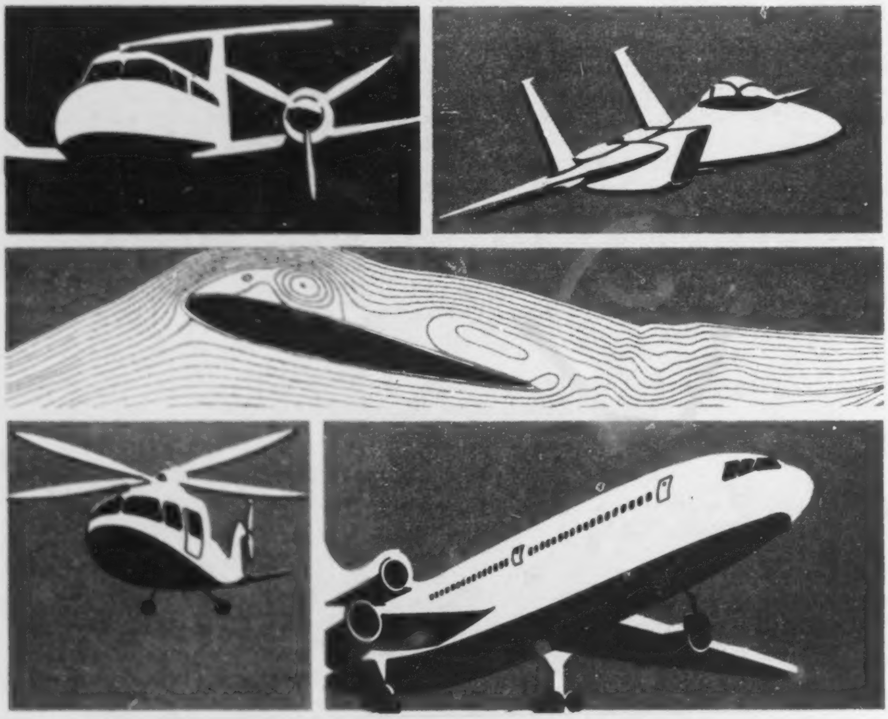
In addition to the above research and technology activities which are directed specifically toward general aviation and commuter aircraft improvements, portions of the general (non-specific application) R&T program and of other vehicle-specific programs in aeronautics have significant relevance to general aviation and commuter aircraft. These include research in basic aerodynamics, composite structures, propulsion, interior noise reduction, high speed propellers, guidance and controls, fire safety, icing research and severe weather and lightning hazards.

Commuter Aircraft Technology Needs. As mentioned earlier, the technology needs of the smaller commuter transports are being given increased consideration. NASA studies over the last three years have shown that major improvements in commuter aircraft performance, economy, ride quality and passenger acceptance could result from the application of technological advances in aerodynamics, structures, controls and propulsion. Particularly important would be the application of advances in improved wing designs for lower drag, high wing loadings and design optimization for the short range mission with emphasis on climb/descent profiles. Weight reductions through advanced composite structures and increased aerodynamic and propulsion efficiencies are also areas that hold much potential for commuter aircraft improvement. Improved fuel efficient engines are desired, as well as better propellers which achieve low noise with high efficiency. Advanced aerodynamic configurations, such as canard and three-surface arrangements, and aft-mounted engines with tractor or pusher propellers will be studied for possible application. Gust load alleviation/ride quality improvements through higher wing loadings and active control feedback systems may be very important to provide the necessary degree of passenger comfort and acceptance.

Whether these technological improvements are actually appropriate and desirable for new U.S. small commuter aircraft is uncertain, in view of the apparent pressures in this segment of the market for reduced cost and complexity and the technical staff and facilities limitations characteristic of some of the smaller manufacturers. We intend to continue working with the commuter aircraft manufacturers and operators to identify the most promising areas of realistic technical improvement, and the appropriate and necessary NASA and industry actions required to achieve them.

NASA'S ROLE IN AERONAUTICS: A Workshop

Volume IV General Aviation



Report to the Workshop by the Panel on General Aviation
Aeronautics and Space Engineering Board
Assembly of Engineering
National Research Council

NOTICE: The project that is the subject of this report was approved by the Governing Board of the National Research Council, whose members are drawn from the Councils of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine. The members of the committee responsible for the report were chosen for their special competences and with regard for appropriate balance.

This report has been reviewed by a group other than the authors according to procedures approved by a Report Review Committee consisting of members of the National Academy of Sciences, the National Academy of Engineering, and the Institute of Medicine.

The National Research Council was established by the National Academy of Sciences in 1916 to associate the broad community of science and technology with the Academy's purposes of furthering knowledge and of advising the federal government. The Council operates in accordance with general policies determined by the Academy under the authority of its congressional charter of 1863, which establishes the Academy as a private, nonprofit, self-governing membership corporation. The Council has become the principal operating agency of both the National Academy of Sciences and the National Academy of Engineering in the conduct of their services to the government, the public, and the scientific and engineering communities. It is administered jointly by both Academies and the Institute of Medicine. The National Academy of Engineering and the Institute of Medicine were established in 1964 and 1970, respectively, under the charter of the National Academy of Sciences.

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Copies of this publication are available from:

Aeronautics and Space Engineering Board
National Research Council
2101 Constitution Avenue, N.W.
Washington, D.C. 20418

IN MEMORIAM

As this report was nearing completion in October 1980, the workshop participants were saddened by the death of Malcolm S. Harned, Chairman of the Panel on General Aviation Aircraft, a distinguished colleague and a major contributor to their deliberations and conclusions.

WORKSHOP ON THE ROLE OF NASA IN AERONAUTICS

GENERAL AVIATION PANEL

Malcolm S. Harned, Chairman
Senior Vice President, Technology
Cessna Aircraft Company

M. Craig Beard
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Federal Aviation Administration

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Edward W. Stimpson
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Leslie Waters
Vice President, Aeronautical Engineering
Aircraft Products Division
Teledyne Continental Motors

PREFACE

Aeronautics is changing in many significant respects. The implications of this are so far-reaching as to call into question the future position of the United States in world aviation.

The magnitude of this question, with its possible consequences for the nation's economy and security, led the National Aeronautics and Space Administration (NASA) to seek an independent evaluation from the Aeronautics and Space Engineering Board (ASEB) of the National Research Council's Assembly of Engineering. Specifically, the ASEB was asked to assess the nature and implications of the current state of U.S. aviation in a world setting and their significance for NASA's role in the nation's aeronautical future.

The ASEB responded by convening a workshop July 27 through August 2, 1980, at the National Academy of Sciences' Woods Hole Study Center. The workshop was structured into four panels covering military aviation, transport aircraft, general aviation, and rotorcraft. In addition, an overview panel was formed to consider NASA's role in research as well as its relationships with other elements of the aeronautics community.

The central task of the workshop was to examine the relationship of NASA's aeronautical research capabilities to the state of U.S. aviation and to make recommendations about NASA's future roles in aeronautics.

NASA and its predecessor, the National Advisory Committee for Aeronautics (NACA), traditionally have maintained a cooperative relationship with the aeronautical industry, with other government agencies concerned with aircraft operations and regulations, and with the academic community engaged in aerospace research. This triumvirate was taken into account in planning the workshop and selecting the participants. Thus, representatives from each part of the aeronautical community were invited, and information on NASA's relationship with each was the subject of special presentations prior to the working sessions. Representation from industry was predominant because industry's relationship with NASA is considered to be a key element in examining the present and future roles of NASA.

The members of the workshop panels represented, in total expertise and experience, all of the important sectors of aeronautics: military aircraft and missiles; commercial air transports; general aviation;

rotorcraft; university and private research; airline operations; and government regulatory agencies. In addition, the participants also included representatives of other industries--notably, automotive, electronics, and steel. Including the speakers and other non-panel members, close to 80 individuals participated.

The participants were asked to address the issue of NASA's role in the context of a wider discussion concerning: the status and dimensions of U.S. aeronautics; the key aeronautical problems and opportunities that are likely to be amenable to research and technology development; the historical evolution and accomplishments of NASA in aeronautical research and technology development; and possible alternatives to NASA. Each of these subjects is discussed thoroughly in separate panel reports.

The report of the workshop consists of seven volumes:

I -- Summary

II -- Report of the Panel on Military Aviation

III -- Report of the Panel on Transport Aircraft

IV -- Report of the Panel on General Aviation

V -- Report of the Panel on Rotorcraft

VI -- Report of the Overview Panel on Aeronautical Research

VII -- Background Papers—The Outlook for Aeronautics and Relevant Areas

In order to help focus the discussion, NASA officials developed and provided a concise set of definitions of eight possible roles for NASA: National Facilities and Expertise; Research; Generic Technology Evolution; Vehicle Class Technology Evolution; Technology Demonstration; Technology Validation; Prototype Development; and, Operations Feasibility. Because some of these roles differ, depending on the aeronautical discipline involved, the roles are assessed within six principal aeronautical disciplines: aerodynamics, structures and materials, propulsion, electronics and avionics, vehicle operations, and human engineering. Definitions of these roles and disciplines are contained in Appendix A. The matching of the roles and disciplines is treated in Volumes II-VI and summarized in Section II of Volume I.

The workshop participants were extensively briefed by officials from NASA, the Department of Defense (DOD), and the Federal Aviation Administration (FAA), by leaders from the aviation manufacturing and operating industries, and by a member of Congress. The briefings are to be found in Volume VII.

Each panel separately considered the national benefits produced within the dimensions of its sector and the relative state of the sector's world position; each considered the evolution of NASA's role, as well as a rationale for NASA's aeronautical support of its sector; and, finally, each panel produced sector-oriented conclusions and recommendations for NASA's roles for the future. Although there are obvious overlaps, the similarities and differences in each of the panels' findings are preserved in the separate reports of the sector-oriented panels, Volumes II-V.

This document, Volume IV, presents the findings and recommendations of the Panel on General Aviation.

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INTRODUCTION

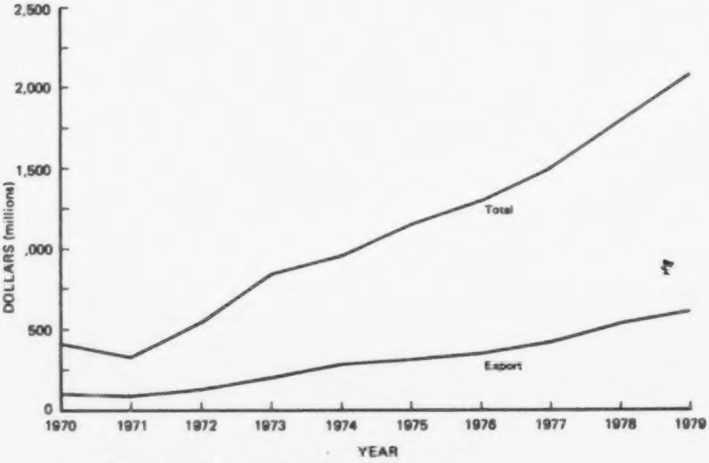
General aviation is defined as all aviation except the military and the large air carrier operations. It therefore includes business, air taxi, commuter, agricultural, training, and personal aircraft.

During the past decade, general aviation has experienced rapid growth and become an essential part of the nation's air transportation system. Such growth is due principally to the expansion and decentralization of many American corporations. Without business aircraft, the rapid industrial expansion of the past 20 years could have been considerably more difficult.

In addition, a continuing decline in airline service to smaller communities is evident since the quadrupling of the cost of fuel and, particularly, since airline deregulation. Of the nation's 14,000 airports, fewer than 350 are served by the larger airlines, and only an additional 360 receive any type of commuter service.[1] About 70 percent of the passengers enplane at the 30 major hub airports, and one-third enplane at the top five terminals. Also, in the last 20 years, service has been discontinued to over one-third of the cities served by the airlines. This year, general aviation will transport more than 110 million passengers in inter-city travel, in contrast to about 300 million transported by the scheduled airlines.

STATUS AND DIMENSIONS OF GENERAL AVIATION

The general aviation domestic fleet includes more than 200,000 aircraft; this accounts for 98 percent of the U.S. civil fleet. The worldwide general aviation fleet numbers about 300,000 aircraft.[2] Approximately three-quarters of the hours flown by the nation's 800,000 pilots are related to business and commercial activities. The dimensions of the industry are illustrated by the growth in sales of new aircraft over the past 10 years, as shown in Figure 1. A forecast of fleet growth for the next 10 years is shown in Table 1.



Source: General Aviation Manufacturers Association.

FIGURE 1 New General Aviation Aircraft Sales

TABLE 1 General Aviation Fleet Forecast

	1980	1990
Single-Engine	167,800	245,000
Multi-Engine	25,400	45,000
Turbo-Prop	3,700	7,300
Turbo-Jet	2,600	6,000

Source: General Aviation Manufacturers Association.

General aviation's most significant segment is business transportation. This area includes aircraft ranging from intercontinental business jets to single-engine, two-place aircraft. Of Fortune's top 1000 companies, 522 owned aircraft in 1978; these were the larger corporations, accounting for 85 percent of the sales and assets of the top 1000.[3] Many more aircraft, however, are flown by smaller companies and businessmen. In fact, more than 56,000 aircraft are flown solely for business purposes.

Business transportation is expected to continue as one of the fastest growing segments of general aviation. As industry continues to decentralize and as airlines continue to reduce service to smaller communities, general aviation will become an ever more essential form of transportation for business.

The Airline Deregulation Act of 1977 accelerated the growth of the commuter air carrier services as well as business flying. Last year, this segment of general aviation carried more than 13 million passengers and provided scheduled air transportation to more than 630 airports. Since the deregulation of airline fares and routes, the commuters have replaced services abandoned by the larger airlines at approximately 60 airports.[1] Service to these airports and the communities they serve is heavily dependent on the availability of safe, efficient general aviation aircraft.

Currently, many manufacturers are preparing to meet the needs of this expanding market, and several new commuter aircraft have already been announced. It is significant that most of these designs are being developed by foreign manufacturers that receive financial and technical support from their governments.

Another aspect of general aviation involves air taxis, which provide "on demand" air transportation to smaller cities for many business people and for others who cannot justify aircraft ownership. Today, there are approximately 2500 air taxi companies operating 7000 aircraft.[2]

General aviation aircraft also are used for agricultural and industrial purposes. In the United States, there are 9000 aircraft that seed, fertilize, and spray more than one-quarter of a billion acres of crops per year and use one-ninth of the fuel that tractors would consume in covering the same farmland.[2]

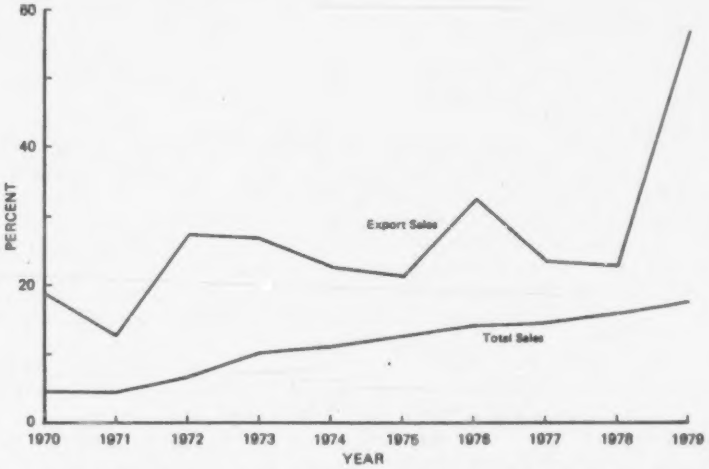
In addition, industrial and special-use general aviation aircraft provide such vital public services as emergency air ambulances, forest fire fighting, pipeline patrol, fish spotting, and law enforcement.

The vast majority of the nation's pilots come from the ranks of general aviation. In 1980, approximately 55,000 people will receive private pilot licenses. A large number of these will continue their training to receive advanced ratings, and they will serve as a manpower pool for the airlines, corporate aviation, and the military.

The Economic Contribution of General Aviation

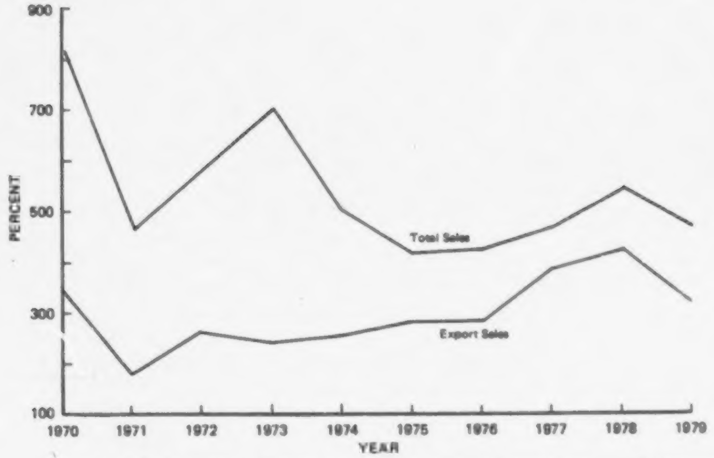
General aviation is an essential element in establishing and maintaining U.S. preeminence in aeronautics. Because of the diverse and important roles general aviation plays in business transportation, utility services, agriculture, training, and short haul travel, this segment of aeronautics shares equally with airline and military aircraft in contributing to U.S. economic strength and political prestige throughout the world.

The economic value of general aviation can be expressed in several ways. More than $3 billion dollars of aircraft and equipment were sold last year. General aviation contributed nearly $1 billion to the U.S. balance of payments. The general aviation industry provides jobs for 300,000 people in the U.S., one-third of them in manufacturing. Its total contribution to the U.S. economy is approximately $10 billion per year.[2] Its growth relative to the other segments of aviation is shown in Figures 2, 3, and 4. The figures present general aviation sales as percentages of the military, helicopter, and transport sales, respectively.



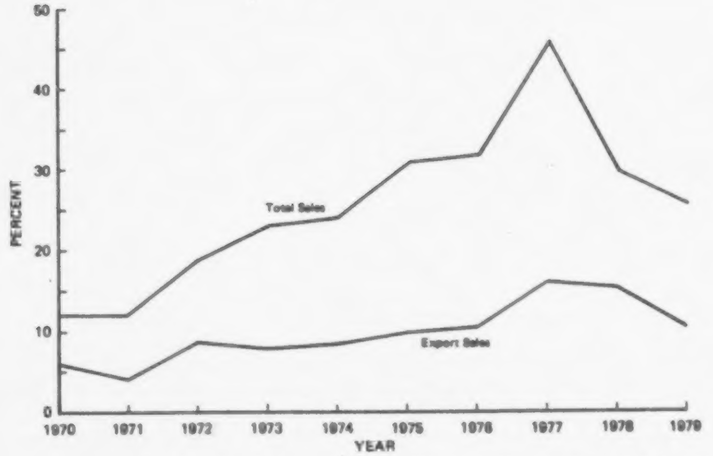
Source: Aviation Week and Space Technology, March 3, 1980 and Aerospace Facts and Figures 1979/1980, Aerospace Industries Association.

FIGURE 2 Percent General Aviation Sales to Military Aircraft Sales



Source: Aviation Week and Space Technology, March 3, 1980 and Aerospace Facts and Figures 1979/1980, Aerospace Industries Association.

FIGURE 3 Percent General Aviation Sales to Helicopter Sales



Source: Aviation Week and Space Technology, March 3, 1980 and Aerospace Facts and Figures 1979/1980, Aerospace Industries Association.

FIGURE 4 Percent General Aviation Sales to Transport Aircraft Sales

The U.S. general aviation fleet is expected to grow to more than 300,000 aircraft by 1990. (See Table 1.) The business jet fleet alone is expected to reach 6000 aircraft. This is twice the projected size of the scheduled airline fleet. It is anticipated that the turboprop fleet will grow from 3700 aircraft in 1980 to 7300 by 1990. Thus, there will be more than 13,000 turbine-powered aircraft in general aviation. In 1980, the hours flown in general aviation are expected to exceed 41 million, five times the number flown by the scheduled airlines, and the Federal Aviation Administration (FAA) forecasts that 62 million hours will be flown in general aviation by 1990.[4]

General aviation is one of the few industries that exports 25 to 30 percent of its production. The United States currently accounts for 85 to 90 percent of the world market in general aviation aircraft units and 75 percent in dollar volume.[2] It is anticipated that the international market will grow significantly as airlines throughout the world react to the rising costs of fuel and labor by consolidating service between the major city-pairs that guarantee high load factors.

The expanding export market throughout the 1980s will be aided by the developing nations as they turn more toward the use of general aviation. Emerging nations also represent a valuable export market, because general aviation aircraft often are used to develop business and provide transportation systems where road and rail networks do not exist.

The Future

Traditionally, aviation has held an importance that extends beyond its measurable economic value. It is a highly visible and effective expression of a nation's technical capability. Often a country selects aviation as a primary means for announcing its technical and economic growth by establishing a national airline and an aircraft manufacturing capability.

Because of their greater numbers and more diverse roles, general aviation aircraft are visible to more people throughout the world than are airliners and military aircraft. Consequently, general aviation is at least an equal partner with the other elements in the aeronautical community in establishing and maintaining U.S. prestige abroad. But U.S. preeminence in general aviation is being seriously challenged in the 1980s. Major technical developments in advanced airfoils are being made in West Germany through the work of Eppler and Wortmann, and these are being used in aircraft designed at Dornier. The use of computer-aided design and supercritical aerodynamics by Dassault in France in its Falcon 50 is widely respected throughout the business aircraft community. Dowty Rotol of Great Britain has incorporated advanced technology in its new propellers, and these are now standard equipment on several U.S. turboprop aircraft. The British government is underwriting much of the costs of Learfan's efforts in Northern Ireland to manufacture a business aircraft built entirely from graphite epoxy composite material.

More than 20 companies in 17 nations are competing with U.S.

industry for the growing worldwide market in general aviation. Among the foreign competitors, it is the general practice for their governments to provide financial incentives for all phases of aircraft production and sales, including research and development, tooling, and fabrication, as well as the provision of attractive financing for marketing. Several foreign companies are pursuing aggressively the advantages of new technology in their aircraft designs, and these high-technology airplanes are likely to represent a competitive threat to U.S. aircraft. Thus, unless U.S. aircraft are technically superior, the nation's general aviation industry cannot demand the higher prices required to overcome the subsidies granted the foreign manufacturers.

No longer can the U.S. general aviation industry rely on its present designs to sustain the leadership position the nation has enjoyed worldwide. General aviation must develop new technology if the industry and the nation are to counter increasing foreign competition and maintain worldwide supremacy.

RESEARCH AND TECHNOLOGY NEEDS IN GENERAL AVIATION

The primary requirements of general aviation aircraft are significant improvements in flight safety and fuel efficiency. The need for safety is clearly indicated because fatality rates are worse in general aviation than motor vehicle fatality rates and are two orders of magnitude poorer than the safety record of the trunk airlines. Even though corporate and business flying is an order of magnitude better than the overall general aviation record, it also should be significantly improved.

Fuel economy is important for general aviation. Representative fuel efficiency data, as reported by individual manufacturers, are shown in Table 2. The "mpg" ratings compare favorably with domestic cars and commercial airplanes in use today, but not with the automobiles and aircraft that are under development.

TABLE 2 General Aviation Fuel Efficiency: Typical 1980 Aircraft

Model	Statute Miles per Gallon	Seat Miles per Gallon
Mooney 201	19.5	78
Cessna P210	14.7	88
Beech A36	14.4	86
Piper Saratoga SP	12.6	76
Cessna 421	7.0	49
Cessna 441	5.5	55
Gates Learjet 35A	3.5	28

Source: Each manufacturer.

Additional important objectives for general aviation aircraft are:

- Reduce interior and exterior noise levels;
- Reduce maintenance;
- Reduce cost of ownership, particularly operating costs; and
- Improve reliability.

The new technologies required to achieve these critical objectives are briefly described below.

Aerodynamics

Enhanced flight characteristics to improve operational safety and new configurations to reduce the propulsive energy requirements of small aircraft are the most critical aerodynamic needs of general aviation.

New o. improved airfoils, coupled with developments in wing and wing/body configurations and/or control capabilities, will improve aerodynamic efficiency while reducing requirements for piloting skills in general aviation aircraft. Such achievements, which are applicable to single- and multi-engine aircraft, also will improve safety.

Structures and Materials

The dominant need in new structural technology is to develop the ncessary knowledge to make full use of advanced composite materials for general aviation, with special emphasis on Kevlar or aramid fibers. It is feasible to obtain a 35 percent reduction in structural weight, plus reduced interior noise, improved structural life and cleaner contours for reduced drag. The greater use of Kevlar in tires in 10 to 20 years, if the material proves successful, should reduce its price, making it practical for wider use in aircraft and resulting in higher quality aircraft.

Crashworthiness design also is an important requirement in general aviation aircraft. Such technology will be particularly necessary when composite structures are widely incorporated into general aviation aircraft - the knowledge base for crashworthy design using the materials does not exist today.

Propulsion: Turbine

Because general aviation turbine engines are small in comparison to transport and military power plants, unique technologies are required to achieve higher pressure ratios and higher efficiency centrifugal compressors, as well as higher turbine-inlet temperature capabilities with lower cost turbine construction. The technologies are essential to achieving reduced fuel consumption and lower cost engines, and they should be obtained while maintaining a multi-fuel capability.

Propulsion: Intermittent Combustion Engines

The dominant need in general aviation is improved fuel efficiency; increased reliability and the ability to use middle distillates are secondary objectives, though important. Since several years will be needed to achieve these goals by developing new engine types, improvements are needed in current engines.

Electronic fuel controls, as well as turbochargers with improved durability, higher pressure ratios, higher efficiency, and lighter weight will improve fuel efficiency and increase reliability. Fabrication and design methods employing lightweight materials should be developed, with the goal being a 30 percent reduction in engine weight.

Propulsion: Propellers

Because of their inherent propulsive efficiency, propellers will be used on nearly 95 percent of present and future general aviation aircraft.

Yet, little advancement in general aviation propeller technology has been evident in this country since World War II, in spite of the serious need for propellers of higher efficiency for commuter and business aircraft. The need for propeller research has been stimulated by the high cost of fuel, more stringent noise requirements, and increasing emphasis on safety.

High propeller efficiency must be developed over a wide range of operating conditions. Lower noise levels, longer structural life for blades, lower cost (including maintenance costs), and lower weight are required if the United States is to retain its competitive edge in the world market for general aviation products.

Electronics and Avionics

Most general aviation flying is done by businessmen-pilots. Since they must operate in the same complex air traffic environment as professional executive and air transport crews, a special need exists in general aviation to reduce the pilot's workload and to simplify the pilot's flight control, navigation, communications, and weather-related tasks. Improvements in reduced workload will apply equally to personal pilots and to the two-person crews for commuter airlines.

Operations

To improve general aviation safety, research is needed to detect and disseminate real-time weather information, particularly thunderstorm information, winds aloft, and atmospheric icing conditions. Improved technologies also are needed to protect the general aviation airframe, propeller, and engine from the accumulation of ice in flight.

Research should be conducted to improve the operational efficiency of Air Traffic Control (ATC) systems. Inefficiencies in ATC systems can cause delays that could offset the gains in fuel efficiency made possible by research in NASA's traditional areas of work.

Human Engineering

Because general aviation aircraft are flown by the most diverse and often least experienced members of the aviation community, a unique need exists for advances in human engineering. Enhanced general aviation safety and efficiency will result from simplifying cockpits, improving the readability of instruments, and improving avionics, controls, and displays that reduce pilot workload and the consequences of human error. Easier means for accurate fuel management and improved flight control systems, including stability augmentation, also will lead to higher levels of flight safety and fuel efficiency. Human engineering research should be conducted in the area of designs for maintenance simplicity, including maintenance monitoring and diagnostic techniques, particularly because the industry anticipates increasing shortages in the number of skilled mechanics.

EVOLUTION OF NASA'S ROLE IN GENERAL AVIATION AERONAUTICS

From its inception in 1915 to the start of World War II, the research work of the National Advisory Committee for Aeronautics (NACA) was of great benefit to the entire aeronautical community - although primarily conducted to support military aviation. In many cases, the performance of military and commercial aircraft was nearly identical, the problems confronted in the development of each were quite similar, and not infrequently both types were designed by the same staff.

With World War II came an immense expansion of aeronautical development in the United States. By 1945, aircraft production capacity had increased vastly, and a network of airfields with paved runways had been constructed. Technology had advanced to the point where airliners could fly at speeds that only five years earlier were the sole province of fighter aircraft, and some fighter planes were flirting with the speed of sound. During the next decade, the jet engine pushed military aircraft to supersonic speeds, and the airlines wrested the long-range passenger market from trains and ocean liners. The airframe companies found it desirable to split their activities into commercial and military divisions. The NACA found that the frontiers of aerodynamics and propulsion technology for military aircraft, pressing into the realm of supersonic flight, had extended beyond commercial aviation. For the first time, the research and development needs of the two segments of the industry were substantially different.

In the 1950s, general aviation began to emerge as a significant mode of transportation. Even so, the technology for general aviation was far from the aeronautical frontiers being explored in the 1950s and 1960s. The 1971 Civil Aviation Research and Development (CARD) study, conducted jointly by the Department of Transportation (DOT) and NASA, recommended that NASA limit its research in general aviation to factors relating to safety. Consequently, NASA's attempts to introduce other research activities related to general aviation were unsuccessful.

As important as safety is, product improvement in general aviation demands both the application of existing advanced technologies and the generation of new research relating especially to airfoils, propellers, materials, and propulsion systems. Without the necessary in-house capability, and without specific NASA assistance, the general aviation industry's development of these technologies has been a slow and difficult process. The result has been that today's general aviation products have yet to reach their full potential.

NASA'S ROLE IN GENERAL AVIATION AERONAUTICS: 1980 AND BEYOND

General aviation needs substantial new technology development to fulfill the technology needs previously outlined. In particular, an order of magnitude improvement in safety and a 50 percent increase in mpg are needed for future models.

NASA aerodynamics and avionics research on commercial airliners benefits business-jet technology. That is about the only benefit obtained from the NASA research conducted for large airliners and military aircraft. The great differences in size between general aviation aircraft and the wide-body transports result in almost completely different structural design parameters. Moreover, the bulk of general aviation aircraft will always be propeller driven and smaller than the commercial transport, necessitating entirely different lines of research.

NASA's general aviation effort, in 1980, is less than 3 percent of its aeronautical research and technology (R&T) budget and only 175 out of 4000 people working in aeronautics were devoted to general aviation research.

The panel's recommendations regarding the roles that NASA should play in the 1980s and beyond are summarized in Figure 5. The following sections describe the types of effort that NASA could provide for the future design and development of general aviation aircraft, within the context of the general technology needs previously outlined.

Aerodynamics

Because flight safety and fuel efficiency are of primary concern, the aerodynamics research and development requirements for general aviation fall into three major categories: high-lift considerations (including control systems), low drag, and handling qualities. The small size and configurations of typical general aviation machines present particular aerodynamic conditions that require special consideration.

Operational experience has demonstrated a strong relationship between flight safety and the aircraft's ability to fly slowly while maintaining strong, positive control during landing approach

NASA ROLE CODE:
1. Major Role
*2. Moderate Role
*3. Minor Role
*– No Role

ROLES	DISCIPLINES							
			PROPULSION					
	AERODYNAMICS	STRUCTURES & MATERIALS	TURBINE ENGINES	INT. COMBUST. ENGINES	PROPELLERS	ELECTRONICS & AVIONICS	VEHICLE OPERATIONS	HUMAN ENGINEERING
NATIONAL FACILITIES & EXPERTISE	1	1	1	1	1	3	1	1
RESEARCH	1	1	1	1	1	–	1	1
GENERIC TECHNOLOGY EVOLUTION	1	1	1	1	1	3	1	–
VEHICLE CLASS TECHNOLOGY EVOLUTION	2	1	1	1	1	3	1	1
TECHNOLOGY DEMONSTRATION	1	1	1	1	1	3	1	–
TECHNOLOGY VALIDATION	–	2	2	2	2	–	1	–
PROTOTYPE DEVELOPMENT	–	–	–	–	–	–	–	–
OPERATIONS FEASIBILITY	–	–	–	–	–	–	–	–

*If a proposed project or program initially falls in a recommended moderate, minor, or no-role category, but, following review of its merits on an individual case basis, is deemed to be a desirable undertaking by virtue of its being in the national interest, or mandated by the Congress or as a result of review it is concluded there are other overriding circumstances, then NASA's role for that project or program would be elevated to a major one (i.e., Category 1).

FIGURE 5 GENERAL AVIATION Role/Discipline Matrix

maneuvers. Nearly 50 percent of all general aviation accidents occur during the final phase of flight. Thus, particular interest is focused on the development of high-lift systems that can be utilized with high-aspect-ratio wings employing low-drag airfoils. Such airfoils are typical of those that will be employed by energy-efficient aircraft.

Low-drag research must be directed toward systems that increase the extent of laminar flow over both wing and fuselage surfaces, toward interference between wing and body surfaces, and toward powerplant/airframe integration (particularly engine cooling drag and boundary layer-slipstream or propeller inflow interactions). Vortex modifiers such as winglets also need continued development.

Much still remains to be done to improve the handling qualities of general aviation aircraft in order to simplify piloting tasks. Systems that provide stall-avoidance and improve flight-path control also are needed.

Structures and Materials

The timely development of advanced composite technology for general aviation is dependent on NASA's performance of the following types of efforts:

- Improve the compressive strength of Kevlar;
- Find a new matrix material that will cure well below 350° F and as close to room temperature as possible;
- Develop improved design approaches for using advanced composites;
- Reduce manufacturing costs;
- Develop low cost and effective inspection techniques;
- Develop strength analysis techniques; and
- Establish data on fatigue and damage tolerance.

NASA's investigations of the applications of composites should include not only major airframe structures but also propellers and landing gear. In addition, extensive research is needed in the area of the crashworthiness characteristics of composite structures, because such materials are significantly different from aluminum. Full-scale structural mockup testing will be required, as well as material and component testing. In doing this, the research will need to extend through the Technology Validation phase, with extensive NASA work in-house and contract projects with universities and the industry.

Propulsion: Turbine

General aviation propulsion systems must meet the following challenges in the 1990s:

- Improved fuel economy and performance;
- Increased reliability and safety;
- Lower manufacturing cost;
- Improved material technology; and
- Durability and lower maintenance.

NASA can best contribute to finding answers to these challenges in small propulsion turbines for general aviation by conducting programs in the following areas:

- Component technology of compressors. combustors. turbines, seals, and nozzles;
- Materials for advance turbine engines;
- Alternative fuels;

- Low-cost manufacturing technology, such as laminated turbine construction;
- Ceramics for turbines;
- Engine aeroelastic and aerodynamic measurement techniques; and
- Advanced codes and numerical methods.

The U.S. gas turbine manufacturers have a significant share of the worldwide turboprop market and dominate the turbofan market. If this position is to be maintained, it is necessary to maintain a superior technical capability in these disciplines. NASA has the requisite skills and facilities that, together with the universities and industry, can contribute significantly to the technical superiority of small aircraft propulsion systems.

Propulsion: Intermittent Combustion Engines

The current concern for fuel cost and fuel availability is a motivating force in the pursuit of technological leads toward engines with substantially better fuel efficiency and broad-specification fuel capability. All known alternative engine systems should be analyzed for the most promising concepts. The alternatives already identified are a diesel engine, a rotary engine, and an advanced concept spark-ignition engine. Turbochargers of higher pressure ratio and higher overall efficiency with lower weight also are required. The basic technologies essential to the success of the selected systems should be developed to the level that soundness is demonstrated.

The properties of engine components fabricated in advanced materials need to be determined; in addition, manufacturing and design methods need to be developed. Weight reductions of 30 percent might be achieved using fiber composite structures and powder metallurgy developments.

The cost of airplane maintenance can be reduced and safety improved by electronic diagnostic systems, which could be applied to indicate engine condition. This will help alleviate a future maintenance problem that is likely to occur with the expected shortage of mechanics in the next decade.

Propulsion: Propellers

Studies conducted by NASA and the industry show that the application of advanced technology to general aviation propellers could result in reducing fuel consumption by approximately 10 percent. This benefit will be sought by utilizing new aerodynamic technology such as improved airfoils; proper thickness distribution and planform; and propeller innovations such as proplets, smooth surface finishes, and suitable propeller/nacelle integration. Furthermore, noise levels can be considerably lowered (approximately 5 dB) by proper acoustic design. Lower weight, lower manufacturing cost, and enhanced safety are achievable by replacing the present aluminum blades with new materials such as advanced composites. NASA has a role in the development and demonstration of such technologies. In developing the technologies, flight tests are essential. Ground and wind-tunnel tests cannot fully demonstrate propeller characteristics because of flow interference effects.

Electronics and Avionics

The general aviation avionics industry, spurred by active competition and breakthroughs in digital electronics technology (e.g., large-scale integrated circuits, microprocessors, and microcomputers), has demonstrated an aggressive and effective responsiveness to the increasing needs of pilots for the integrated and simplified display of weather and operational data in today's complex air traffic system.

While NASA is unlikely to make major contributions in avionics for general aviation, the avionics community has limited capability to develop basic sensors and display components vital to optimum use of the technology. In the area of basic sensors that measure such things as altitude, pressure, engine temperatures and vibration, NASA should provide research help in developing low-cost, reliable units with digital outputs.

Vehicle Operations

NASA scientists and facilities could be important in developing an improved definition of atmospheric icing conditions in detectable and reportable gradations of severity. The agency also should place a high priority on enhancing the technology of in-flight ice protection for use on general aviation aircraft.

Moreover, NASA should maintain its existing facilities and expertise and undertake basic research toward improving the efficiency of the Air Traffic Control (ATC) system. NASA's technical capabilities can be of value to Federal Aviation Administration (FAA).

To enhance safety and aid pilots in lowering fuel consumption, NASA should provide information to the National Oceanic and Atmospheric Administration (NOAA) and the FAA on techniques for measuring and disseminating winds-aloft data and other real-time weather information.

Human Engineering

The field of human engineering is increasingly important in the design of all categories of aircraft. This technology can have a particularly significant impact in general aviation because many general aviation pilots have limited opportunities to maintain their proficiency. To increase the safety of flight under these circumstances, NASA should conduct investigations of cockpit controls and displays from basic Research through Technology Evolution to reduce the pilot's workload significantly.

The efficiency and operating costs of general aviation aircraft can be improved significantly by designs that use human engineering to achieve maintenance simplicity. Improved aircraft maintenance may be expected from the development of monitoring and diagnostic equipment and techniques.

Why NASA?

The last few years have seen a loss of U.S. dominance in some industries in which, at one time, the nation was the world leader. Many reasons have been advanced, post facto, including inadequate productivity, increasing labor costs, loss of U.S. innovation capacity and/or ability to bring new or improved products to market, real or alleged predatory practices on the part of foreign governments with mixed economies, rapidly escalating social programs and large social costs. Whatever the reason, the effects are real. The United States can no longer expect to maintain superiority, or, in some cases, parity in world markets in all fields through the efforts of individual companies.

Foreign competitors have made impressive inroads in U.S. international and domestic markets by focusing on selected fields and products. The most current example is the rapid rise in imports of Japanese cars.

How does this apply to general aviation? This industry has always been a very difficult business in which the few have succeeded, principally because these companies have been able to run austere operations. Based on sales of aircraft models, the industry is characterized as low-volume and subject to cyclic fluctuations in demand. Investment in tooling, along with the most straightforward design development for a new model, can pose a risk to a company's existence. Consequently, technological risk has been avoided and only well-proven technology has been used. Almost all "new" models have been derivatives of previous aircraft, which retained much of the previous engineering and tooling. Even the successful companies have limited facilities and technical expertise for developing advanced designs. These companies simply cannot afford the risk of incorporating unproven new technology in their products.

NASA is the logical organization to conduct general aviation research. It has the facilities, expertise, and prestige necessary for such programs. Existing NASA facilities are applicable; the expertise is available in all of the pertinent disciplines; and the agency has experience in assembling an efficient team involving industry, government, and academe. Whatever questions have been asked about NASA's role in aeronautics in the past, it is imperative to maximize utilization of the agency in support of the domestic industry immediately.

Also, in the past, facing negligible foreign competition, U.S. firms have been able to proceed without advancing the state of the art. However, two new factors -- heavily subsidized foreign competition and quintupling of the cost of fuel -- require significant technological advances in order for U.S. aircraft to compete effectively in the future, either at home or abroad.

In the past, general aviation has benefited from data generated by NACA and NASA for the military and for commercial transports. At present, general aviation requires new NASA technology specifically for general aviation. The industry accepts foreign competition; but, in view of heavy foreign government subsidies and the realities of the marketplace, advanced technology to retain the U.S. lead in general aviation is imperative.

CONCLUSIONS

The panel concludes that:

- The U.S. general aviation industry makes a significant contribution to:

  - The national transportation system;
  - The balance of trade;
  - The national economy;
  - U.S. international prestige; and
  - Employment.

- U.S. preeminence in general aviation has been eroded by foreign aircraft manufacturers. Foreign manufacturers presently have the majority of orders for heavy business jets and commuter aircraft, and their market share is increasing dramatically.

- A substantially improved flow of new technology is imperative if the general aviation industry is to maintain a strong world position.

- The general aviation industry cannot generate the required technology by itself.

- NASA is the most eminently suited entity available to carry out the necessary research and technology development effort. It has the facilities, the proven expertise, and the endorsement of industry to execute this work.

- Current levels of NASA research and technology (R&T) funding are inadequate to provide the timely enactment of enabling technologies for general aviation.

- NASA does not have a strategic plan dedicated to general aviation consistent with industry goals.

RECOMMENDATIONS

Recognizing that maintenance of a healthy general aviation industry is in the national interest, the panel recommends that:

- o A technology program, particularly one that focuses on improving fuel efficiency and safety, be agressively pursued by NASA to assure U.S. supremacy in general aviation.
- o NASA be assigned the role of leading the basic research and technology effort in general aviation up through Technology Demonstration.
- o A strategic plan be developed by NASA, in association with the general aviation industry, and implemented as soon as possible, certainly in time for the 1982 budget cycle.
- o A NASA R&T budget be allocated for general aviation adequate to support the proposed plan. Funding needs to be several times the present level.

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APPENDIX A

DEFINITIONS OF ROLES AND DISCIPLINES

To facilitate the task undertaken by the participants in the ASEB workshop, a series of definitions of possible roles for NASA was developed. The roles represent steps in the hierarchy of the research and development process, beginning with a desire for knowledge and an understanding of basic phenomena, an idea, or technical concept, and ending with the design and construction of a vehicle, a vehicle component, or a new operational system.

Definitions of Possible Roles for NASA

Each of the following eight roles as defined by NASA was reviewed by the participants, and the panels considered the extent to which NASA should carry out these roles.

National Facilities and Expertise

This category comprises the development and maintenance of test facilities, including wind tunnels, simulators, and computers, as well as the maintenance of personnel with specialized skills, technical knowledge, and expertise in the field of aeronautics.

Research

Programs in this category are designed to gain basic knowledge and understanding of physical phenomena and processes in all discipline areas relevant to aeronautics. The work is fundamental in character and is performed within NASA, at universities, in industry, and by independent research organizations.

Generic Technology Evolution

This category involves the pursuit of the results of specific lines of basic research that show promise of generating technology broadly applicable to a number of classes of vehicles. The work is evolutionary in nature and leads to the continued advancement of technology.

Such advances generally precede focused technology development in support of specific vehicle class needs. The work is conducted primarily within NASA, with appropriate university and industry support.

Vehicle Class Technology Evolution

NASA programs in this category concentrate on specific vehicle classes and on the preparation of the unique technology data base required to improve the design and development of certain classes of aircraft. Activities include generating and evaluating new concepts and configuration approaches for the vehicle classes. Examples include V/STOL and supersonic cruise vehicles. In both cases, the technologies unique to those classes of aircraft are examined with regard to design feasibility, benefits, costs, etc. Then tailored data bases are developed.

Technology Demonstration

This category includes programs that are conducted to demonstrate the technical feasibility of a technology advance or concept. Activities may include flight testing and component or systems demonstrations. Specific examples in the current NASA program are: Tilt-Rotor Research Aircraft, Energy Efficient Engine, Quiet Short-Haul Research Aircraft, and Terminal Configured Vehicle. Future modifications and tests on an aircraft to demonstrate the feasibility of Laminar Flow Control and flight tests of an Advanced Turboprop would be included in Technology Demonstration.

Technology Validation

This comprises programs that include large-scale ground or flight validation as a necessary step to assure technology transfer. The purpose is to make possible, with minimal risk and without additional technology development, the practical utilization of high-benefit, high-risk conceptual, component, or subsystem technology advances. Specific examples in the present NASA program are: Composite Primary Aircraft Structure (CPAS), Materials for Advanced Turbine Engine (MATE), and Engine Component Improvement (ECI).

Prototype Development

This category consists of design, development, construction, and testing of an aircraft, engine, or system that is sufficiently representative of a planned final product to serve as a production prototype. An example of such a program for the civil sector would be the supersonic transport (SST) program conducted by the FAA during the 1960s. Current NASA programs do not include any prototype developments, and none is currently planned.

Operations Feasibility

This refers to operations conducted as research directed toward evaluating the feasibility or practicality of aircraft system operations to meet special needs or requirements or to demonstrate that a total, integrated operational system (e.g., new aircraft or simulated new aircraft, advanced integrated flight systems, approach and landing techniques, wake vortex alleviation, etc.) provides a service or benefit. The economic, environmental, and/or social aspects are considered.

Definitions of Disciplines

Aerodynamics

Aerodynamics is the science dealing with the motion of air and other gases and with the effects of such motion on objects moving through such media.

Structures and Materials

This is the portion of aeronautical research and technology development dealing with the design of structures (the part of the aircraft, missiles and/or their components whose function is to carry loads in the broadest sense) and the materials used in aircraft and missile construction.

Propulsion

This disciplinary heading includes the part of aeronautical research and technology development relating to the various methods and systems for generating and delivering power for propelling and/or lifting aircraft and missiles.

Electronics and Avionics

Electronics refers to that aircraft and missile electrical equipment that is required for the basic operation of the vehicles--e.g., flight and engine controls. Avionics means the electrical equipment used for mission functions, such as air-to-ground communications and navigation. In military aircraft and missiles, the latter category includes offensive and defensive equipment and weapons control systems.

Vehicle Operations

This area deals directly with operational problems encountered by aircraft and missiles, such as icing, detection and dissemination of weather information, and air traffic control systems.

Human Engineering

This discipline addresses the study of human capabilities and problems that occur at the interfaces between the crew and the aircraft. It includes work on and use of simulators, crew workload studies, and studies of the optimization of cockpit instrumentation and controls.

Dr. **Mark**. Let me try to answer that question in the context of the conversations that I had last night. I think there are two separate problems. One is: "What can NASA do to help the general aviation industry with its current production base?" I think there are some things we can do. For example, we are good at doing new avionics, but we are not good at making avionics as cheaply as possible. It has got to go through a couple of cycles in the industry before it becomes an economic proposition. But, we can do something to help. We can work on things like laminar flow airfoils which can be and have been adopted by the industry fairly quickly. That is one area. What we need there is the guidance and advice from our advisory committees which are made up of people from the aviation industry.

The second issue is: "Are there, on the horizon, technologies that would permit us to leapfrog the competition?" That is, are there some things which we know how to do that nobody else knows how to do, and how can we make the investment necessary to conduct such a leapfrog?

We have recently completed two experimental aircraft, the tilt rotor. If you were at the Paris Air Show this year, you saw one fly. That airplane has enormous potential as a commuter aircraft or as a personal aircraft. The trouble is that the technology is brand new. We can't yet put it on the market because we don't know what the maintenance costs are or the reliability. There are many, many unknowns that have to be answered before we can really say this is a commercial proposition.

I am working very hard with the military to induce them to take on the tilt rotor principles to meet their requirements for search and rescue. The Navy has a requirement for antisubmarine aircraft. I am very hopeful that some time in the next year one of the military services will pick up this airplane. If and when they do, Madam Chairman, then the necessary investment to answer the questions that I have outlined before—reliability, cost of operation and so on—will be answered in due course of the military operations.

Of course, these airplanes will be manufactured for the military by the industry that we speak of today. When that happens, the industry at the right moment will say: OK, now it is time to take the risk to produce this thing for the commercial market." Only industry can make that judgment, we can't make it for them.

What I have just outlined is a traditional way that we have worked with business and aviation in this country, because, as I have already mentioned, the large commercial airliners are, in fact, technical descendants of the long-range military aircraft built in the 1950's.

I remember in the early days of the B-52 program we didn't know what it would take to maintain jet engines, for example. We didn't know that the jet engines would turn out to be much easier to maintain than the reciprocating engines. Nor did we know what the fuel economy would be for them. None of the important calculations needed for commercial enterprises could be made before we had thousands and thousands of hours of military operation. Then we justified the R. & D. on the grounds of military requirements and then, in turn, benefited from the technical fallout that resulted.

If we are looking for a leapfrog operation where we would be the only nation that would have the technology for something like the tilt rotor, I think the first thing is to try to make an investment that the Government can make for purposes of national security, and then insure that when we make that investment, it is done in such a way that the industry can pick it up as soon as they make the judgment that it is commercially viable.

Senator **Kassebaum**. Dr. Mark, what in your opinion is the single most important technological issue that is facing the general aviation industry today?

Mr. **Mark**. I would say that the single most important issue where technology can help is the reduction of operating costs of airplanes, because the price rise in fuel costs has been so dramatic that I have seen many small things we did in the early seventies improve the operation of commercial airplanes and improve engine technology. For example, we did a few things on component replacement, things of that kind, that have had enormous leverage.

I believe the work that we are doing on fuel-efficient engines, efficient propellers, things of that nature, is probably the single most important technical contribution we can make in the near term to that industry.

Senator **Kassebaum**. Thank you.

Mr. **Glickman**. Thank you.

Dr. Mark, let me ask you this. There is a draft proposal from the Heritage Foundation—a conservative think tank—floating around which is making recommendations, at least tentatively, that we end all aeronautical research and development by the Federal Government.

In addition to that, even during the last administration as well as this one, there was a decision made—I think a wrong decision—to begin to scale down some of the dollars that went into aeronautics. In light of the fact that we are possibly facing enormous budget deficits in the next few years, how are we going to be able to fund aeronautical R. & D., given all of these negative factors?

Dr. **Mark**. Mr. Chairman, I have been struggling with justification of aeronautical research and development budgets since 1968, so I have watched these arguments come and go. The Heritage Foundation report, which I have studied carefully, is one which is not new. We had similar propositions in 1969. Why should the Government do aeronautical research and development? In fact, why should we support a healthy industry? The aviation industry is relatively healthy, so why shouldn't we just get out of it? The answer is, of course, very simple, and we had to go through this in every administration. If I may spend, 3 minutes going through the history of aviation, it would be worthwhile perhaps for the record.

When the National Advisory Committee for Aeronautics was established in 1915, the primary motivation was to do something about the inferiority of this country in military aviation. In World War I, Mr. Chairman, not a single combat airplane that actually saw action was manufactured in the United States because we were technologically behind. We couldn't build anything that was good enough to stay in the sky with airplanes of foreign manufacture. It was for this reason that Congress enacted the law I just quoted.

The conclusion was that never again shall we have a situation like that occur. That, of course, is why the National Advisory Committee for Aeronautics was part of the Naval Appropriations Act. The Committee was established, and the membership was set up. The general officer in the Signal Corps of the Army at that time—head of the General Air Service—was made a statutory member of the Committee as well as his counterpart in the Navy. By the time the Committee went out of business in 1956, all three services were represented, Army, Navy, and Air Force. General Doolittle was chairman.

So, NACA was something that had grown in an enormously proliferating way. So much for a historical introduction. The reason I made it is to outline the central importance of military aviation in the Committee. That is the real reason it was established was to assure U.S. air supremacy. That is the primary function today of the air development function.

The event of 2 weeks ago is still another example that we still build the best aircraft in the world, bar none. The F-14 went though my laboratory in 1970-71. When we found we couldn't land it on carriers, we had to help the Navy with control systems to adjust the systems, throttles and so forth, in such a way that the F-14 could set down on an aircraft carrier. These are all anecdotes and perhaps vignettes that I am talking about, but they are helpful in giving you the culture of American aviation, because the criticism is really a cultural one.

Now, what is the problem? To build high performance aircraft, facilities are needed that the private industry cannot by itself afford. We have just put half a billion dollars into an engine test facility in this country. There is no company in the country that can make that kind of investment. NASA and the Air Force did that at the Arnold Engineering Test Station in Tennessee.

NASA has just put $200 million in upgrading and constructing facilities, $100 million on the west coast and $100 million at Langley. That is something again industry could not do. The facilities to do high quality work in aviation are so expensive that only public investment can create them. Now, that is unique to the aeronautical industry. For example, in the chemical industry where you are talking about making new fibers new plastics, or things of that kind, the facilities necessary to do that are small. A few chemists working in the laboratory can come up with an economically important new product. Therefore, the chemical industry can very easily—it can and does—make its own investments in R. & D. and doesn't need the help of the Government.

So, there are two points: The importance of military aviation, which is clearly a function of the Federal Government; and the expense of the facilities necessary to do the work. Both lead to the conclusion that only the Federal Government can nurture this very important field of aviation.

It is clear that our friends in Western Europe and Japan are relying upon their governments. They are copying us, of course, by doing the same thing.

Mr. GLICKMAN. I have one final question on a specific aspect. You mentioned to Senator Kassebaum that among the single most important things we ought to be doing in general aviation is engine efficiency, fuel economy. You are currently working on a project called Prop Fan. Prop Fan, to those who don't know, is the development of a new propeller system that would enable a propeller aircraft to go much faster than it currently does, and with much greater fuel efficiency than jet engines.

Is it your feeling that NASA should continue and in fact expedite work on Prop Fan as it might relate to commuter aviation?

Dr. MARK. Yes, no question about it. We have it in the budget. It is going to stay in the budget. I think this is the type of research that could be picked up very quickly by a new airplane. It is something we really ought to look at very carefully. Incidentally, I should mention that we are working very closely with the industry in developing these propellers. They are not built at NASA laboratories nor done inhouse. We let contracts with the industry to develop the propellers. Then we do joint research.

Hamilton Standard, for example, is the company we are working with on that program. We are also working with the engine companies—General Electric, Pratt & Whitney, and some of the smaller manufacturers—to do the power sections. So, it is already a collaborative program with the manufacturing industry.

Mr. GLICKMAN. I thank you for your testimony and want to say two things: One, I hope you will continue to use whatever influence you can with OMB to try to insure that we have, within budget restraints, reasonable funding levels for aeronautics.

And two, I know that you will continue to get the input of the user community into what things are necessary to help them.

It is a pleasure to have somebody of your caliber in the job that you are in.

Thank you.

Dr. MARK. Thank you. I look forward to hearing my friends from the industry.

Senator KASSEBAUM. Congressman Williams has joined our panel.

Would you like to ask a question?

Mr. WILLIAMS. Yes, Madam Chairwoman, I would like to ask one question which would require only a brief answer. I certainly have been impressed in the past and will continue to be impressed by NASA's ability to provide new technology. However, I was somewhat excited to hear you say that there appears to be some things you can do for the commuter industry that I believe maybe should get more of NASA's attention. That is, using the current state of the art.

I am not sure new technology is going to provide what we need to in fact save this market. I am very concerned that American aircraft producers are dangerously close to losing the commuter market. It is going to escape very quickly and I am not sure new technology is going to provide what we need to save it. If you would just briefly comment on whether or not you agree with that, whether we have time to save it and what role NASA could play in that? I was interested especially in your encouragement to the military to use some of the current state of the art and hopefully, overcome some of these problems.

Dr. **Mark**. Thank you. That is a terribly important question. Let me clarify what I said earlier. There are two separate strategies. One is: "Are there technical things we can do today to help people like Mr. Feher or people like the people in Wichita to improve their airplanes?"

My answer to that was, probably not very much. There are little things that may be important like the more efficient fan and so on, but, by and large, the things we do are to listen to the problems and wherever we can find something to help, do it. Hopefully that will help.

Second is the leapfrog question. There are technologies on the horizons we have developed, especially in V/STOL, vertical short takeoff and landing, where a very large investment is necessary to make them commercially viable. For example, to make the tilt rotor a commercial proposition today, requires, in my judgment, a half a billion dollars to set up. The industry today is not able to raise that kind of money. I have checked. However, the tilt rotor does have military value. So, we can justify public funds for national security. If we are smart, we will insure that the fallout also yields commercial benefit.

So there are two strategies. The later one is a leapfrog question, Mr. Williams. But we are not going to see tilt-rotor airplanes flying commercially for 10 years. We might have them in the military in 5 years. Then, it will take another 5 years to wring out the problems until somebody picks it up. But those are the two things. One is incidental help, which is important to the current state-of-the-art airplanes. The other is to look for ways to leapfrog the competition.

We can have a tilt rotor commercial airplane in 10 years. No one else can, no one else in the world. That is for sure. So the leapfrogging is the other part.

Mr. **Williams**. If I just could comment in closing, we have been in negotiations with the Pentagon trying to impress upon them the importance of the use of these types of aircraft. I am sure those in this community do the same thing. I am just excited to hear you say that, as a very important official from NASA. I appreciate hearing your testimony, Dr. Mark.

Dr. **Mark**. Thank you, sir.

Senator **Kassebaum**. Thank you very much, Doctor. I appreciate your testimony.

Next, the general aviation panel participants. Would you please come forward to the table?

It is a pleasure to welcome this important panel. Accommodate yourselves however you can under the arrangement there. Dan and I were just saying, it is like perching up here and sort of looking down at the table.

It is a pleasure welcoming Harry Combs, president of Gates Learjet; Mike Neuberger, senior vice president, Beech Aircraft; Bob Lair, senior vice president, Cessna Aircraft Corp.; Pat Lehman, International Association of Machinists; Ed Stimpson, president, General Aviation Manufacturers Association.

STATEMENTS OF HARRY COMBS, PRESIDENT, GATES LEARJET CO.; MICHAEL G. NEUBURGER, SENIOR VICE PRESIDENT, BEECH AIRCRAFT CORP.; BOB LAIR, SENIOR VICE PRESIDENT, CESSNA AIRCRAFT CO.; PAT LEHMAN, INTERNATIONAL ASSOCIATION OF MACHINISTS; EDWARD STIMPSON, PRESIDENT, GENERAL AVIATION MANUFACTURERS ASSOCIATION

Mr. COMBS. Thank you, Madam Chairwoman.

Senator, on behalf of Gates Learjet, we commend you for holding the hearings in this city, properly referred to as the general aviation capital of the world. We feel that the subject of your inquiry is timely, topical and I am honored to be a member of the panel.

I would like to ask that my statement be included in the record in full. Meanwhile, in the interest of time, I will summarize pertinent points.

Senator KASSEBAUM. It will be, and I appreciate that.

Mr. COMBS. I am Harry Combs, president of Gates Learjet Corp., an orangization engaged in the design, development, manufacture and marketing of high performance business jets for markets in the United States and abroad. All models in the Learjet line of aircraft now in production are FAA certificated in the air transport category, or FAR part 25.

Additionally, our company operates a nationwide network of aviation sales and service facilities, and a wholly owned subsidiary that produces and sells airborne electronic systems for a wide range of highly advanced civil and military aircraft.

A little over 60 percent of the outstanding common stock of Gates Learjet is owned by the Gates Rubber Co. of Denver, Colo., and the balance is publicly owned. Our company employs more than 6,000 people in seven States—approximately half of them work in Wichita, Kans. In fiscal 1981, which ended this past April 30, Gates Learjet's total sales exceeded $439 million, an all time record. Next year we anticipate sales of over $700 million when our Model 55 series comes onstream. This might be favorably compared with our consolidated sales volume of some $59 million just 10 years ago.

We have delivered nearly 1,200 Learjets, roughly 25 percent of the world's total business and utility jet fleet. Although our segment of the general aviation industry has enjoyed steady growth over the past few years, there are a number of negative factors in today's general aviation equation that tend to dampen our industry's traditional optimism. These include high interest rates. Cost of money is a serious deterrent to capital investment. There are rising costs of material and labor that threaten to price us out of the market.

Third, the requirement to comply with Government regulations is an onerous burden, becoming worse as we go along.

We have proposed increased in fuel taxes that are both discriminatory and grossly inequitable. Significant increases in foreign competition, unfair trade, threatens U.S. firms in the aircraft manufacturing business as our Government takes no interest and no reciprocal action.

There are proposed cuts in airport aid, even though a huge user fund exists for expanding system capacity.

All these are dampers. In considering how the Government might assist our industry without adversely affecting healthy competition, let me begin with a basic premise. In our American society and democratic system as we have it today, the least government is the best government. The preeminent position that the U.S. aircraft manufacturers enjoy in the world today came about not because of the Government but because of the willingness of industry leaders to risk capital investment in research and development.

To put together a marketing system extolling the virtues of all the respective products, and then set about convincing potential buyers of their individual products economic benefits. That is what our company did, that is what other companies have done, and the driving force has been competition.

In our highly competitive marketplace, fuel efficiency performance, utility, after sale support and acquisition and operating costs are the prime considerations influencing decisions of prospective customers. Currently, the market is depressed, yet customer interest remains high, indicating to us that the President's economic recovery program could make a difference. In our view, renewed vitality will largely depend upon the following conditions: A healthy and vigorous U.S. economy, capable of generating new orders at cost competitive prices; industry's ability to maintain a strong marketing and sales support program; availability of suitable financing and credit terms that are competitive worldwide; a fair world trade environment under which U.S. manufacturers will have equal opportunities in international markets; and joint efforts by industry and Government to retain and maintain a superior technology base.

The current true state of our aeronautical capabilities compared to foreign competition, continues to be a subject of considerable debate. But on one very fundamental point most authorities are in total agreement: In recent years U.S. research and development efforts have lagged behind those of other nations. From 1968 to 1980, U.S. R. & D. and fraction of GNP decreased 19 percent, while in the Soviet Union it actually increased by 14 percent, in West Germany by 16 percent and in Japan, by 19 percent.

Even more alarming is the fact that during this 12-year period basic research as a fraction of the Federal budget decreased 27 percent and R. & D., 36 percent. At the same time, the investment by industry in basic research as a fraction of net sales declined 32 percent. And this occurred while much of America's industrial research was being directed toward meeting regulatory and environmental requirements.

It is well documented that research and development and technological innovation play a significant role in our Nation's economic progress. According to studies on U.S. productivity by economist Edward Denison, from 1929 to 1969 about one-third of our Nation's growth was attributable to "advances in knowledge." Yet between 1949 and 1969, this factor accounted for some 48 percent of our growth, making it an even greater contributor than inputs of capital for the time period.

The contribution of R. & D. to economic growth and productivity, therefore, is positive and extensive. But unless the present trend is reversed, U.S. technological progress will be less of a factor in world markets. And declining economic power could result in declining political influence abroad as well.

You may recall that during the summer of 1980 the National Research Council at Woods Hole, Mass., assessed the relative position of United States and foreign activities in aeronautical R. & D. The results of this searching review were most enlightening. One of the workshop conclusions stated:

> New technological advances in aerodynamics, in structures and materials, in electronics, and in propulsion offer the potential for dramatic improvements in the efficiency of aircraft. Such improvements could make obsolete virtually all US aircraft now in production or design. One decade from now, world leadership in aeronautics will be achieved, in all probability, by the nation or nations that seize the initiative and move such technologies from their present research status through the refinement and validation process essential for successful production and operation of more efficient aircraft.

I know that you have heard those words before, quite possibly when Dr. H. Guyford Steer, the workshop chairman, appeared before the Senate Committee on Commerce, Science and Transportation earlier this year. Although this conclusion concerns the future, and does not reflect the present situation, the opinion is, nevertheless, appropriate to your question.

The true state of our aeronautical capabilities today is that the U.S. aircraft manufacturing industry is, indeed, well ahead of the rest of the world. American ingenuity has put together the most efficient combination of metallurgy and petroleum that man has ever devised—we call it an airplane. That is why we are able to sell American built aircraft in every country where freedom of movement prevails. Our products simply outperform the competition.

But, and here Dr. Steer's point becomes germaine, the circumstances are changing. The signs are all about us. Dr. Richard Whitcomb, the distinguished aerodynamicist of the National Aeronautics and Space Administration, recently reflected that the traditional technological spinoff roles appear to be reversing themselves.

Business jet aircraft, for so many years the benefactors of technologies created by others, are now becoming the prime sources of significant innovation. Our company, as an example, was the first commercial manufacturer to adapt the area rule shape and new thrust enhancing wignlets. These developments have been incorporated in Learjet designs in order to help achieve our goal of flying higher and faster with optimum fuel efficiency.

As is generally the case, the quantum leaps are infrequent. I believe the time has come for another quantum leap, especially with respect to new composits and other changes aimed at further reduction in aircraft weight and drag. Cost and future questionable availability of fuel are driving forces that require new techniques, new materials and new concepts.

Our foreign competitors, all of whom are heavily subsidized by their governments are moving ahead of us in some of these technical areas. We cannot afford to go the way of the American automobile industry. I recall all too vividly the comment of one Japanese automaker who, when an American industrialist asked what is wrong with U.S. production capability, responded with this observation: "You have become a crippled giant."

Any evaluation of our assets and liabilities with regard to basic aeronautical research and development capabilities—and international trade policy—is beleagured by perceptions. It is a multifaceted question. For example, one of the aeronautics greatest assets is the intellectual and creative engineering capacity embodied in NASA. Given adequate financial resources by Congress, and the support and encouragement of the President to get back into aeronautical research that does not duplicate private sector efforts, NASA could lead the way for aviation technology's next quantum jump.

NASA can and should expand its aeronautical R. & D., particularly in the areas of basic research. Congress should see to it by appropriate funding and validation. Moreover, the President should support accelerated research and development as a national policy.

The recently concluded multilateral trade negotiations [MTN] brought forth an unprecedented agreement for the international trade of civil aircraft. It held a promise for free and fair trade—without tariffs and nontariff barriers, or at least minimal restrictions without discriminatory application.

The U.S. aircraft industry, including Gates Learjet, strongly supported the development and finalization of the MTN agreement. But time has shown that we may have given away far too much and in return, got very little. It has been suggested that we got the sleeves from the vest but gave away the coat and trousers.

You know the problem: Brazil and Israel, for example, are not signatories—they can sell here, but we cannot sell there. Japan restricts aircraft imports but has unrestricted access to U.S. markets. That kind of policy, which lacks quid pro quo, cannot be called an asset. Also, the budget cutters are trying to strangle the Export-Import Bank and significantly reduce funding for essential loan guarantees, which our foreign competitors enjoy from their governments.

To be fair, the major asset of our international trade policy as it was recently pronounced by Ambassador Bill Brock is the promise of an aggressive government policy with accompanying programs to promote U.S. exports. The promise of support and the willingness to listen to complaints gives us hope that perhaps we will not lose our worldwide dominance after all.

There are a lot of issues yet to be resolved within the framework of GATT, the General Agreement on Trade and Tariffs, and the MTN agreements, but we have confidence that good intentions will prevail and that Congressional support will be forthcoming. President Reagan knows the importance of exports and his cabinet members on the International Economic Policy Council are wise in the ways of international trade and that we view as encouraging and a real asset.

In connection with this last item, we are very concerned that a large faction of the Congress still believes DISC, or the Domestic International Sales Corporation as it is formally known, should be abolished. DISC was authorized in 1971 to increase American exports, thus improving the U.S. balance of trade. It enables corporations to form DISC subsidiaries, consolidate all their income from exports, and defer a portion of the taxes levied on that income.

Over the past 10 years over 8,000 DISC subsidiaries have been established, many of them in general aviation. Our DISC subsidiary is called the Gates Learjet Export Corp. Since its inception in 1973, our company's DISC has handled nearly one-half billion dollars in export sales. Not only have DISC organizations helped increase shipments abroad, they have created more jobs at home. But if DISC is discontinued, the net result could mean higher export prices which, in turn, might reduce general aviation's total sales volume.

On the question of where the Government should focus its aeronautical research and development, our answer is simple but specific. We believe federally sponsored programs should concentrate on basic research in aerodynamics, composite materials, propulsion systems and fuels, and in new structural innovations.

NASA's greatest and most constructive contribution is in the development of concepts—then industry can apply those concepts to its products, just as we did with area rule and winglet technology. We need more basic research in composites. This would include the techniques of composite fabrication, the properties and physical characteristics of the material, the environmental impact and long-term effects, such as fatigue life, and the suitability of such material for primary structure in transport category aircraft. We would also like to see more work in powerplants and fuels, especially alternative energy sources, such as hydrogen and alcohol.

Unfortunately, cutbacks in NASA's aeronautics budget will seriously affect those segments of the aerospace industry that face the strongest competition from nationalized or subsidized foreign manufacturers.

In view of declining Federal support of aeronautical R. & D., we commend the administration and congressional leaders for recognizing the need for additional tax incentives to stimulate private sector research and development. Over the past 5 years our company has invested almost $50 million on basic research alone, which represents more than 3.3 percent of Gates Learjet's annual sales and more than 50 percent of our total net worth.

A review of NASA's fiscal 1982 authorization and appropriations bills yet to be ironed out in conference next month reflects the fact that the Senate is attempting to put more funding into aeronautical programs. We hope the Senate levels will prevail.

The threat of foreign competition may not emanate solely from abroad. Granted, American business jet companies have successfully led in sales in the world marketplace. But official neglect, such as Government policies of monetary "benign neglect," could be consequential. For example, the abandonment of free trade principles in the name of human rights, a Carter administration policy still on the books, has handicapped the industry by severly limiting potential sales.

Overzealous bureaucratic intervention manifested by export license control policies, as part of COCOM—an international agreement to control high technology exports to the Eastern bloc nations—is yet another marketing impediment. There have been several instances where applications to export have been delayed to a point where the sale was lost. There have been incidents where foreign manufacturers of a COCOM nation stepped in and sold their aircraft—approved quickly by their respective governments—while the U.S. company application languished in our Department of Commerce.

Foreign governments as a matter of official policy promote the sale of their nation's aircraft. The level of direct foreign government subsidy to a particular country's aircraft manufacturing industry varies, but its existence is a serious threat to the U.S. plane builders, not only in our own domestic market, but in "Third World" nations as well.

In conclusion, we recommend for your consideration some specific steps which in our opinion would greatly enhance the American aviation industry's ability to compete effectively worldwide:

A. Enforce the provisions of the MTN Agreement on International Trade of Civil Aircraft by all signatories, particularly in regard to sales in third countries.

B. Minimize the content of the commodity control list used by the Department of Commerce for controlling/requiring export licenses.

C. Now that the Reagan administration has rescinded the so-called Carter leprosy letter, Government programs within our overseas embassies should be expanded to promote the sales of U.S.-built aircraft.

D. Fund Eximbank to permit broader use of its guaranteed loan programs supporting the sale of all civil aircraft.

E. Restore adequate funding and then mandate a higher level of interest and activity within NASA on basic aeronautical research, particularly in the areas of new aerodynamic concepts, primary composite structures, alternative fuels and other advanced propulsion technology.

F. Prepare even better tax incentives for private industry research and development, such as a total tax credit of R. & D. to a specified limit. We greatly appreciate the opportunity of sharing some of our views with you today. I will be pleased to respond to any questions you may have. Thank you.

[The prepared statement of Mr. Combs follows:]

STATEMENT BY HARRY B. COMBS, PRESIDENT OF GATES LEARJET CORPORATION, BEFORE JOINT HEARINGS ON GENERAL AVIATION CONDUCTED BY THE HOUSE SCIENCE AND TECHNOLOGY SUBCOMMITTEE ON TRANSPORTATION, AVIATION, AND MATERIALS AND THE SENATE COMMERCE, SCIENCE AND TRANSPORTATION SUBCOMMITTEE ON AVIATION: AUGUST 27, 1981, IN WICHITA, KANSAS

Thank you, Mr. Chairman. I am Harry B. Combs, president of Gates Learjet Corporation, an organization engaged in the design, development, manufacture and marketing of high performance business jets for markets in the United States and abroad. All models in the Learjet line of aircraft now in production are FAA certificated in the air transport category, or FAR Part 25. Additionally, our company operates a nationwide network of aviation sales and service facilities, and a wholly-owned subsidiary that produces and sells airborne electronic systems for a wide range of highly advanced civil and military aircraft.

A little over 60 percent of the outstanding common stock of Gates Learjet is owned by The Gates Rubber Company of Denver, Colorado, and the balance is publicly owned. Our company employs more than 6,000 people in seven states -- approximately half of them work here in Wichita, Kansas. In fiscal 1981, which ended this past April 30, Gates Learjet's total sales exceeded $439,000,000, an all-time record. This might be compared with our consolidated sales volume of some $59,000,000 just 10 years ago.

I should add that in our most recent fiscal year approximately one-third of our total sales represented exports to markets outside the U.S., including various agencies of many foreign governments. It might be worth noting that despite the fact we lead the entire business jet industry in cumulative deliveries of new aircraft, only one Federal agency of the U.S.

government, the National Aeronautics and Space Administration, has ever purchased a Learjet. And, since our first delivery in 1964, we have delivered nearly 1,200 Learjets, roughly 25 percent of the world's total business and utility jet fleet.

Although our segment of the general aviation industry has enjoyed steady growth over the past few years, there is at this time an aura of uneasiness about the future vitality of the business/utility jet market. Considerable uncertainty pervades our corporate and industry planning. There are a number of negative factors in today's general aviation equation that tend to dampen our industry's traditional optimism, including:

a. High interest rates -- the cost of money is a serious deterrent to capital investment.

b. Rising costs of materials and labor.

c. Compliance with government regulation.

d. Proposed increases in fuel taxes that are both discriminatory and gross inequitable.

e. Significant increases in foreign competition -- unfair trade threatens U.S. firms in which our government takes no interest and no reciprocal action.

f. Cuts in airport aid, even though a huge user fund exists for expanding system capacity.

Before addressing the five issues itemized in your letter of July 22, may I commend the Committees for undertaking these joint hearings. It is most gratifying to know that our concerns are shared in the Congress. Our ability to compete in the world marketplace will totally disintegrate unless U.S. foreign policy protects and promotes America's industrial interests. In the world community of nations, too many trade treaties and bilaterals fall far short of achieving their original objectives of stimulating commerce between "consenting" countries.

1. Government Support of Civil Aviation

In considering how the government might assist our industry without adversely affecting healthy competition, let me begin with a basic premise: In our society, the least government is the best government.

The preeminent position that U.S. aircraft manufacturers enjoy in the world today came about because of the willingness of industry leaders to risk capital investment in research and development, to put together a marketing system extolling the virtues of their respective products, and then to set about convincing potential buyers of their individual product's economic benefits. That's what our company did -- and the driving force has been competition.

In our highly competitive marketplace, fuel efficiency, performance, utility, after-sale support, and acquisition and operating costs are the prime considerations influencing the decision of prospective customers.

There is no government role in the customer's decision to buy or not to buy -- and that is as it should be! But over the past few years the old adage that success breeds contempt has become somewhat of a truism in our industry, insofar as government policies are concerned.

You will recall the Carter Administration's effort to impose a six percent excise tax on new aircraft and avionics equipment. Fortunately the wisdom of Congress prevailed and the proposal was denied. Other attempts to impose user charges in various ways have threatened the viability of our industry.

As you know, even now we are facing an outrageous proposal to increase fuel taxes. If it is enacted, the resulting increase in operating costs would severly impact potential sales. It is the propensity of some government fiscal managers to penalize success that the Congress must be alert for and prevent.

Currently the market for many makes and models of U.S. general aviation aircraft is depressed. Our own company backlog now stands at $1 billion, but the market for business jets has softened since the first of the year and orders so far in 1981 have fallen short of our original projections.

As I said earlier, uncertainty has set in and with it "buy" decisions are being delayed. Yet customer interest remains high, indicating to us that the implementation of President Reagan's economic recovery program could make a difference. The degree to which U.S. business values the prospects of the President's program will dictate the near-term results.

In our view renewed vitality in the business aviation marketplace will largely depend upon the following conditions:

a. A healthy and vigorous U.S. domestic economy, capable of generating sufficient new aircraft orders at cost-competitive prices.

b. Industry's ability to maintain a strong marketing and sales support program.

c. Availability of suitable financing and credit terms that are competitive worldwide.

d. A fair world trade environment under which U.S. manufacturers will have equal opportunities in international markets.

e. Joint efforts by industry and government to again develop and maintain a superior technology base.

2. Comparing Aeronautical Capabilities

The current true state of our aeronautical capabilities compared to foreign competition continues to be a subject of considerable debate. But on one very fundamental point most authorities are in total agreement: In recent years U.S. research and development efforts have lagged behind those of other nations.

Thirty days ago, on July 27, Senator John Glenn of Ohio cited some statistics that clearly show a most disturbing trend in our national commitment to R & D. In the 12-year period, 1968 to 1980, for example, the United States R & D as a fraction of GNP (Gross National Product) decreased 19 percent -- while in the Soviet Union it actually increased by 14 percent, in West Germany by 16 percent, and in Japan by 19 percent.

These numbers take on added economic significance when it is recognized that approximately 40 percent of all U.S. R & D is defense related. But only about two percent and eight percent of Japan's and West Germany's R & D, respectively, are being spent on military projects and programs.

Even more alarming is the fact that during this 12-year period basic research as a fraction of the Federal budget decreased 27 percent and R & D, 36 percent. At the same time, the investment by industry in basic research as a fraction of net sales declined 32 percent. And this occurred while much of America's industrial research was being directed toward meeting regulatory and environmental requirements.

It is well documented that research and development and technological innovation play a significant role in our nation's economic progress.

According to studies on U.S. productivity by economist Edward Denison, from 1929 to 1969 about one-third of our nation's growth was attributable to "advances in knowledge." Yet between 1949 and 1969, this factor accounted for some 48 percent of our growth -- making it an even greater contributor than inputs of capital for that time period.

The contribution of R & D to economic growth and productivity, therefore, is positive and extensive. But unless the present trend is reversed, the U.S. will be less of a factor in world markets. And declining economic power could result in declining political influence abroad as well.

You may recall that during the summer of 1980 the National Research Council at Woods Hole, Massachusetts, assessed the relative position of U.S. and foreign activities in aeronautical R & D. The results of this searching review were most enlightening. One of the Workshop conclusions stated:

> "New technological advances in aerodynamics, in structures and materials, in electronics, and in propulsion offer the potential for dramatic improvements in the efficiency of aircraft. Such improvements could make obsolete virtually all U.S. aircraft now in production or design. One decade from now, world leadership in aeronautics will be achieved, in all probability, by the nation or nations that sieze the initiative and move such technologies from their present research status through the refinement and validation process essential for successful production and operation of more efficient aircraft."

I know that you have heard those words before, quite possibly when Dr. H. Guyford Steer,[1] the Workshop chairman, appeared before the Senate

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[1] "Report of A Workshop on NASA's Role in Aeronautics". Statement of Dr. H. Guyford Steer, March 10, 1981, before the Senate Committee on Commerce, Science and Transportation.

Committee on Commerce, Science and Transportation earlier this year. Although this conclusion concerns the future, and does not reflect the present situation, the opinion is, nevertheless, appropriate to your question.

The true state of our aeronautical capabilities today is that the U.S. aircraft manufacturing industry is, indeed, well ahead of the rest of the world. American ingenuity has put together the most efficient combination of metalurgy and petroleum that man has ever devised -- we call it an airplane. That's why we are able to sell American-built aircraft in every country where freedom of movement prevails. Our products simply outperform the competition.

But, and here Dr. Steer's point becomes germaine, the circumstances are changing. The signs are all about us. Dr. Richard Whitcomb the distinguished aerodynamisist of the National Aeronautics and Space Administration, recently reflected that the traditional technological "spinoff" roles appear to be reversing themselves.2/

Business jet aircraft, for so many years the benefactors of technologies created by others, are now becoming the prime sources of significant innovation. Our company, as an example, was the first commercial manufacturer to adapt the area rule shape and new thrust-enhancing winglets, both conceived by Dr. Whitcomb and his associates of NASA, for civil production aircraft. These developments have been incorporated in Learjet designs in order to help achieve our goal of flying higher and faster with optimum fuel efficiency.

2/ Remarks by Dr. Richard Whitcomb in response to NBAA presentation honoring his achievements.

However, it would now appear that the business aircraft industry has reached a reasonable state-of-the-art where technological advances, up to the year 2000, at least, will be largely devoted to refinements in fuel efficiencies, greater cabin comfort, improved cockpit displays and the like. As is generally the case in the evolution of technical progress, quantum leaps are infrequent.[3/] I believe the time has come for another quantum leap, especially with respect to new composites, more miniaturization and other design innovations aimed at further reductions in aircraft weight and drag.

The cost and the future questionable availability of fuel are driving forces that require new techniques, new materials and new concepts. Our foreign competitors, all of whom are heavily subsidized by their governments, are moving ahead of us in some of these technical areas. We cannot afford to go the way of the American automobile industry. I recall all too vividly the comment of one Japanese auto maker who, when an American industrialist asked what's wrong with U.S. production capability, responded with this observation: "You have become a crippled giant."

3. Assets and Liabilities in Research and World Trade

Any evaluation of our assets and liabilities with regard to basic aeronautical research and development capabilities -- and international trade policy -- is beleagured by perceptions. It is a multifaceted question. For example, one of aeronautics greatest assets is the intellectual and creative engineering capacity embodied in NASA. Given

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3/ John H. Winant, President, NBAA presentation at the International Aerospace Symposium, Paris, France, June 3, 1981.

adequate financial resources by Congress, and the support and encouragement of the President to get back into aeronautical research that does not duplicate private sector efforts, NASA could lead the way for aviation technology's next quantum jump.

But R & D has become so politicized by the Office of Management and Budget (OMB) and Congressional budget cutters that what could be and should be a national asset has become somewhat of a liability. It is a liability because funding is minimal, and encouragement for action meek. The result is that NASA is being damned by faint praise. And we manufacturers, with high hopes for the vigorous application of NASA's unique abilities in basic research, have become frustrated and impatient.

We in industry have constant dialogue with NASA through a variety of forums. Such meetings serve to set priorities for mutual objectives and to reaffirm the industry's needs. Good words and good intentions -- but then little happens. It is an exasperating experience that causes us to seek other remedies that are far more costly and, for the most part, far less rewarding.

NASA can and should expand its aeronautical R & D, particularly in the areas of basic research. Congress should see to it by appropriate funding and validation. Moreoever, the President should support accelerated research and development as a national policy. Then and only then can NASA's aeronautical endeavors be called an asset, which Webster defines as "anything owned that has exchange value; a valuable or desirable thing to have."

The recently concluded Multilateral Trade Negotiations (MTN) brought forth an unprecedented agreement for the international trade of civil aircraft. It held a promise for free and fair trade -- without tariffs and non-tariff barriers, or at least minimal restrictions without discriminatory application.

The U.S. aircraft industry, including Gates Learjet, strongly supported the development and finalization of the MTN agreement. But time has shown that we may have given away far too much and in return, got very little. It has been suggested that we got the sleeves from the vest but gave away the coat and trousers.

You know the problem: Brazil and Israel, for example, are not signatories -- they can sell here, but we can't sell there. Japan restricts aircraft imports but has unrestricted access to U.S. markets. That kind of policy, which lacks quid pro quo, cannot be called an asset. Also, the budget cutters are trying to strangle the Export-Import Bank and significantly reduce funding for essential loan guarantees, which our foreign competitors enjoy from their governments.

To be fair, the major asset of our international trade policy as it was recently pronounced by Ambassador Bill Brock is the promise of an aggressive government policy with accompanying programs to promote U.S. exports. The promise of support and the willingness to listen to complaints gives us hope that perhaps we will not lose our worldwide dominance after all.

There are a lot of issues yet to be resolved within the framework of GATT, the General Agreement on Trade and Tariffs, and the MTN agreements, but we have confidence that good intentions will prevail and that Congressional support will be forthcoming. President Reagan knows the importance of exports and his cabinet members on the International Economic Policy Council are wise in the ways of international trade and that we view as encouraging and a real asset.

In connection with this last item, we are very concerned that a large faction of the Congress still believes DISC, or the Domestic International Sales Corporation as it is formally known, should be abolished. DISC was authorized in 1971 to increase American exports, thus improving the U.S. balance of trade. It enables corporations to form DISC subsidiaries, consolidate all their income from exports, and defer a portion of the taxes levied on that income.

Over the past 10 years over 8,000 DISC subsidiaries have been established, many of them in general aviation. Our DISC subsidiary is called the Gates Learjet Export Corporation. Since it's inception in 1973, our company's DISC has handled nearly one-half billion dollars in export sales. Not only have DISC organizations helped increase shipments abroad, they have created more jobs at home. But if DISC is discontinued, the net result could mean higher export prices which, in turn, might reduce general aviation's total sales volume.

4. Federally Sponsored Aeronautical R & D

On the question of where the government should focus its aeronautical research and development, our answer is simple but specific. We believe Federally sponsored programs should concentrate on basic research in aerodynamics, composite materials, propulsion systems and fuels, and in new structural innovations. I would stress that NASA should let industry develop the "nice-to-have" electronic instrumentation or gadgetry. Also, we don't believe that it is a good use of NASA resources to design complete aircraft, such as any effort to develop a better commuter transport or agricultural vehicle.

NASA's greatest and most constructive contribution is in the development of concepts -- then industry can apply those concepts to its products, just as we did with area rule and winglet technology. We need more basic research in composites. This would include the techniques of composite fabrication, the properties and physical characteristics of the material, the environmental impact and long-term effects, such as fatigue life, and the suitability of such material for primary structure in transport category aircraft. We would also like to see more work in powerplants and fuels, especially alternative energy sources, such as hydrogen and alcohol.

Unfortunately, cutbacks in NASA's aeronautics budget will seriously affect those segments of the aerospace industry that face the strongest competition from nationalized or subsidized foreign manufacturers.

There is always a question of why the Federal government and NASA should be supporting aeronautics research when we have a large and seemingly healthy industry. But as Dr. Jack L. Kerrebrock, associate administrator for the Office of Aeronautics and Space Technology, recently stated, the success of the aerospace industry has been based on an interaction between manufacturers and NASA -- and its predecessor organization, NACA -- that goes back many years. Today industry and even the military, Dr. Kerrebrock noted, are unable to commit funding and management attention to the kinds of high risk programs that NASA has been working on.

NASA has the facilities, expertise and support of industry to carry out programs that are beyond the capacity of industry to do itself. And the benefits are too numerous to recite here. Suffice to say that many design features and on-board systems of today's aircraft had their genesis in NASA laboratories. We would be the first to say that the agency's work has contributed in a substantial degree to safer, more efficient, more productive and more acceptable flight.

In view of declining Federal support of aeronautical R & D, we commend the Administration and congressional leaders for recognizing the need for additional tax incentives to stimulate private sector research and development. Over the past five years our company has invested almost $50 million dollars on basic research alone, which represents more than 3.3 percent of Gates Learjet's annual sales and more than 50 percent of our total net worth.

A review of NASA's fiscal 1982 authorization and appropriations bills yet to be ironed out in Conference next month reflects the fact that the Senate is attempting to put more funding into aeronautical programs. We hope the Senate levels will prevail.

NASA Administrator James Beggs seems to be on the right track in his stated goal to increase NASA aeronautical research activities.[4/] He certainly won our hearts when he publicly stated that "the agency should keep in mind that aeronautics ... is kept fed and healthy, because if we want to continue to lead the world in aeronautics, we have got to continue the basic work that provides the foundation for that." However, we were distressed to see indications of reducing, rather than expanding,

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4/ AVIATION DAILY, August 3, 1981

aeronautical R & D. It is hoped your respective Committees will urge that this not be done.

5. Enhancing Effective Competition in World Markets

There are several actions that the Federal government might take to enhance the private sector's ability to compete effectively in the world aviation market. But first, let's quickly review the market shares of all makers of certificated civil business jets manufactured worldwide as of July 1, 1981:

	Number of Units	Percent of Market Share
Gates Learjet	1,141	25.8
Cessna Citation	896	20.3
Dassault (Falcon)	610	13.8
Hawker Siddeley 125	479	10.8
Rockwell Sabreliner	428	9.7
Israeli A/I (Westwind)	316	7.1
Gulfstream II/III	266	6.0
Lockheed JetStar	200	4.5
Corvett	40	0.9
Hansa Jet	35	0.8
Canadair Challenger	11	0.3

As you will note, the U.S. business jet manufacturers comprise five companies of the 11 listed. And total U.S. market share is about 66.3 percent. The Lockheed JetStar, incidentally, is now out of production. Yet even a cursory examination of current economic, demographic and political forces -- population growth, inflation, recession, unemployment, food shortages, and ecological and environmental problems -- suggest that changes to the established order are probably inevitable.

A comprehensive report published by the Aerospace Industries Association (AIA) [5/] postulates that the economic and political environment over

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[5/] AIA Research Report, "The Challenge of Foreign Competition,"November 1975 the next decade will be characterized by economic, social and political strains as nations vie for resources and power, and as new trade and capital flows evolve. The study further states that these changes will determine not only the potential market size but also the marketing environment in which we will have to operate.

The threat of foreign competition may not emanate solely from abroad. Granted, American business jet companies have successfully led in sales in the world marketplace. But official neglect, such as government policies of monetary "benign neglect," could be consequential. For example, the abandonment of free trade principles in the name of human rights, a Carter Administration policy still on the books, has handicapped the industry by severly limiting potential sales.

Over-zealous bureaucratic intervention manifested by export license control policies, as part of COCOM -- an international agreement to control high technology exports to the Eastern bloc nations -- is yet another marketing impediment. There have been several instances where applications to export have been delayed to a point where the sale was lost. There have been incidents where foreign manufacturers of a COCOM nation stepped in and sold their aircraft -- approved quickly by their respective governments -- while the U.S. company application languished in our Department of Commerce.

Foreign governments as a matter of official policy promote the sale of their nation's aircraft. The level of direct foreign government subsidy to a particular country's aircraft manufacturing industry varies, but its existence is a serious threat to the U.S. plane builders, not only in our own domestic market, but in "third world" nations as well. These are the influencing government actions, or lack of action, that could increase the relative competitiveness of foreign manufacturers.

In conclusion, we recommend for your consideration some specific steps which in our opinion would greatly enhance the American aviation industry's ability to compete effectively worldwide:

a. Enforce the provisions of the MTN Agreement on International Trade of Civil Aircraft by all signatories, particularly in regard to sales in third countries.

b. Minimize the content of the commodity control list used by the Department of Commerce for controlling/requiring export licenses.

c. Now that the Reagan Administration has rescinded the so-called Carter "leprosy letter," government programs within our overseas embassies should be expanded to promote the sales of U.S. built aircraft.

d. Urge and fund Eximbank to permit broader use of its guaranteed loan programs supporting the sale of all civil aircraft.

e. Restore adequate funding and then mandate a higher level of interest and activity within NASA on basic aeronautical research, particularly in the areas of new aerodynamic concepts, primary composite structures, alternative fuels and other advanced propulsion technology.

f. Prepare even better tax incentives for private industry research and development, such as a total tax credit up to a specified limit.

We greatly appreciate the opportunity of sharing some of our views with you today. I will be pleased to respond to any questions you may have. Thank you.

Senator KASSEBAUM. Thank you very much. We have decided perhaps it would facilitate things to have everyone present their testimony. Then we will ask questions of the whole panel. Mr. Neuburger.

Mr. NEUBURGER. Thank you Senator Kassebaum and Congressman Glickman we are delighted to be here today to share some of our views on the state of the general aviation and commuter industries. I am Michael G. Neuburger, senior vice president of the International Division and a director of Beech Aircraft Corp.

Before proceeding into the heart of my testimony, I would like to address several of the questions established in your letter of invitation to appear here today. You asked, generally, what the Government could do to assist the private sector in developing general and commuter aviation. Basically, you and your colleagues have already accomplished much for the economic health of the country and our industry with passage of the Reagan administration's tax and budget cuts. The President's program for economic recovery should reduce inflationary costs thereby lessening the total outlay for high ticket items like aircraft. We expect a temporary adverse reception in our foreign markets as the dollar becomes stronger compared with many currencies and relative costs for the international customer increases. However, in the long term we would of course prefer to compete in the world marketplace from a position of economic strength. This sets the tone for remarks to follow aimed at specific areas where the Government can be of further help in moderating the impact of past policies.

We were heartened recently by the agreement reached between the Federal Aviation Administration and the general aviation community in the wake of the strike by the air traffic controllers union. It reflected our commitment to work with the Government to mutually solve problems that face the private and public sectors. And it recognized the important rôle general aviation plays in the country's air transportation system. Undoubtedly, the major inconvenience of the strike focused on the aviation community. However, we join other general aviation interests in commending the Reagan administration for its firm handling of the situation. That resolve in the face of intense pressures will lessen the probability other Government segments will be subjected to illegal work stoppages by Federal employees.

In the area of Government sponsored research and development, our view is that public funds are better spent for basic investigations, rather than hardware development. Research responsibilities are more effective if they are consolidated under one agency. The National Aeronautics and Space Administration is the appropriate agency for these activities. In our judgment, NASA's efforts in the general aviation area should be directed toward increasing the energy efficiency of aircraft, especially in view of the growing concerns regarding energy resources. In this environment of budget cuts, longer range research programs should be deferred. In our judgment the share of funds assigned to basic research supporting general aviation is inadequate to meet the requirements for innovative solutions to the industry's challenges.

Again, general aviation must be accorded its share of available resources in proportion to its contribution to the well being of the country. In a country as vast as the United States the only viable national transportation system will be aviation oriented. Solutions are far different here than in smaller, more densely populated countries. We should point out that we are not advocating an increase in total funds, just a better understanding of the portion which should be targeted for general aviation. We subscribe to the philosophy of reducing the Federal budget and taxes, so nothing said here should detract from the overall goal. It appears that an organized program approach to basic research by NASA is the most effective method for accommodating the needs of the aviation community.

We are concerned about the controls placed on technical information developed by NASA in connection with use of that information for competitive purposes by foreign manufacturers. Perhaps discussions need to begin on limiting this information for consumption within the United States by American manufacturers.

Of growing concern to the industry and our company is the airport/airway system in the United States. Without a doubt reliever airports in this country require improvements. Additionally, in some areas, more relievers would be desirable. Senate bill 1272, which incorporates increased user taxes for the general aviation operator, warrants the support of Beech Aircraft. It would provide financial resources to meet projected safety requirements and allow for a reduction in the huge surplus lying fallow in the aviation trust fund. Fuel taxes would increase under the proposal within a single tier—an equitable way to spread costs associated with use of the system.

As you know the FAA has initiated a program to temporarily close towers at some airports as a result of the air controllers strike. We would hope that the action will not reduce the number of towers to the point where it becomes impractical to operate general aviation aircraft in the system. One of our greatest selling points is that general aviation airplanes can operate at many more locations than larger commercial jetliners. Widespread tower closings seems inconsistent with the desire to provide more and enhanced reliever airport facilities to accommodate overflow general aviation traffic near larger more commercially oriented airports. For example, the tower and airport at Hutchinson uniquely serves as an important reliever for aircraft testing by Kansas manufacturers.

However, in those cases where towers must be withdrawn from the Federal system permanently because of budgetary and traffic volume considerations, we urge the private sector and local municipalities to assume operational responsibility. Operation of our own tower at Beech Field in Wichita is an example of private enterprise in that role. Perhaps at those towers facing closure arrangements could be made to lease or sell the installed equipment so that it remains well utilized. We support FAA initiatives to review the entire air traffic control system in the United States. As we market our aircraft within the United States several discouraging trends have emerged. Fewer pilots are remaining active and fewer people are learning to fly, mostly due to high fuel costs.

We have also discovered that foreign manufacturers subsidized by their respective governments are shaping the marketplace. In our smaller, corporate, and commuter markets we are experiencing competition from government subsidized or operated companies located in some 12 countries. The planes, mostly commuters, are either competing in the market today or will be by the mid-1980's. In the meantime their product development is being underwritten in great measure by their governments. When these aircraft enter production our competitors are assured their governments will be backing them completely. Most foreign commuter aircraft have also a companion corporate version which will compete in the U.S. marketplace. As you know, it can take hundreds of millions of dollars and 5 to 7 years to develop new aircraft today. American manufacturers have no guarantee and no Government backing, so the ability to compete aggressively with companies which have such support is lessened.

Financing has become a critical sales factor in today's marketplace. Interest rates in the United States are well into the double digit range. But foreign competitors can offer American customers low interest loans subsidized by their governments. They can move more easily into markets which were established through good customer relations, thorough after sale support and quality products. Unfortunately, with the advent of predatory financing techniques, many customers make purchase decisions based on interest expenses rather than product performance and efficiency.

In the commuter market, last year customers for Brazil's subsidized aircraft were offered interest rates as low as 7½ percent. Those terms are unheard of in the United States. To take a typical example, assume an aircraft loan is negotiated for 8 years in the amount of $1.3 million. The difference in interest expense between the 9 percent available with a foreign manufacturer and 18 percent in the United States is more than $630,000. I might add here, Madame Chairman, that we do have substantiating evidence if the committee would like to have that entered in the record now, or later.

Senator KASSEBAUM. Fine, it will be entered into the record.

[The information follows:]

Beech Aircraft Corporation
Wichita, Kansas 67201
U.S.A.

MICHAEL G. NEUBURGER
SENIOR VICE PRESIDENT
INTERNATIONAL DIVISION

September 18, 1981

Ambassador David R. Macdonald
Deputy United States Trade Representative
Room 200
600 17th St., N.W.
Washington, D. C. 20506

Dear Mr. Ambassador:

To assist you in the bilateral discussions with Brazil so that items of substance rather than discussions on principles, may be placed on the agenda, you will be interested in a current example. It illustrates the disparity of conditions under which we as a private enterprise company are confronting competition from the Brazilian national industry.

The case revolves around a requirement of the Peruvian Navy for a fleet of 6 Maritime Surveillance aircraft. The value of the order is approximately $21 Million. The contest has narrowed down to where the Peruvian Navy prefers the pressurized, more sophisticated proven BEECHCRAFT Super King Air 200 Maritime Surveillance airplane, but is being pressured by the Brazilian Government to buy the unpressurized Bandeirante offering less performance and less capability.

The Brazilian offer is promoted, first of all, by the President of Brazil who intervened personally. The Brazilian Government, not Embraer, is offering a package which besides the Bandeirante, includes machine guns, bombs, rockets, missiles and hangars.

The Brazilian Government offers financing, 10 years with 3 year's grace, an interest rate of 9%, and all quoted in dollars so that the cruzeiro inflation is absorbed by the Brazilian Government.

We have offered financing through commercial banks based on current money market conditions: 8 years, 2 year's grace and 1 1/4% interest over LIBOR. This is quite favorable in today's conditions but, of course, not as generous as the Brazilian proposals which simply cannot be matched by American business.

I do not argue the fact that it is within the sovereign power of the Brazilian Government to promote sales of a national industry and offer any terms that it considers supportable by the Brazilian taxpayer.

However, I believe it is time to dispel the myth that Embraer is a private enterprise company. No private enterprise company is in a position to offer package deals of offset and mobilize political pressure and subsidized financing. No private enterprise company competing in the U.S. market could threaten Boeing with the Airbus when that company is not even in the same transport manufacturing industry, unless it is an arm of the Brazilian Government.

It is, therefore, my recommendation that the bilateral negotiations once and for all be based on the reality that the Brazilian industry is not private enterprise.

When that principle is accepted as the base of negotiation, other matters can then be discussed with a greater sense of realism; with respect to competition in Third Country markets, and competition in the U.S. market.

Brazil cannot have it both ways.

Therefore:

1. A subsidized government promoted Brazilian industry must accept intervention by the U.S. Government to protect U.S. industry from unfair competition in its own market, to the extent current U.S. law permits and that it is a reasonable act by U.S. industry to seek protection from Congress and the Administration.

2. The Brazilians may avert such action only by opening the Brazilian market in the same manner the U.S. market is open. No tokenism, no restrictions.

The bilateral negotiations have too long been hampered by a reluctance on the U.S. side to recognize reality, and on the Brazilian side by playing games to evade the real issues.

If the facts were mutually recognized we would probably arrive at solutions which in the long run would not be detrimental to Brazil either.

Best regards.

Sincerely,

Michael G. Neuburger

MGN:cc
cc - Dr. Stephen Piper
Mr. E. C. Burns - BAC
Mr. Ed Stimpson - GAMA

Mr. **Neuburger**. We must recognize that the market in the United States is much greater than the home market of any foreign manufacturer. Therefore, foreign competition will go to extremes to exploit the U.S. marketplace. During 1980 we experienced the loss of millions of dollars in sales solely because of predatory financing and predatory financing is by the way not only interest rates but also expressed in very liberal grace periods that are being offered by foreign competition, which means 1 or 2 years of no payment. International sales of general aviation aircraft are also significant for their impact on employment and the Kansas economy. Generally, industrial employment in the United States depends on exports for one job out of six. For Kansas, every third or fourth job is export related.

This is reflected in world market share. U.S. manufacturers, until a few short years ago, had 90 percent of the world market in general aviation aircraft. About 70 percent came from Kansas. Under the impact of foreign competition from developed and less developed countries and of export disincentives imposed by the United States, our world market share has been reduced to where it is closer to 60 percent.

At Beech Aircraft an organized international marketing effort was initiated following World War II. In 35 years Beech exported approximately $1.2 billion of its products. The annual share of exports to our commercial production is the industry average of 25 to 30 percent. Beech has sold its products in over 130 different countries.

Unlike other general aviation manufacturers Beech sells abroad every Beechcraft product for which a market can be found through one organization structured to report directly to corporate management. Beech sells all airplane models of the commercial product line, the military-related models such as trainers and special mission airplanes, and its missile target systems. Generally these are sold under direct contract with foreign governments.

Beech has developed, over the last three decades, a distributor organization abroad which covers all major markets. The diversification, geographically and in product spectrum, has helped Beech maintain consistent export growth and stability of its international business.

During the past 8 years international markets kept pace with growth of the market in the United States. However, during recent years certain conditions developed in the international markets which cause the United States to be less competitive. New political or economic barriers were interposed. They are:

The steep reevaluation of the U.S. dollar versus currencies of Europe and other major markets;

High interest rates;

Cost inflation reflected in rising prices for our products;

Shortages and steep price increases of aviation gasoline;

Increasing competition from developed and less developed countries; and

The impact in third country markets of subsidized financing or foreign government supported offsets.

Export disincentives introduced during the previous administration were another factor which caused us to lose important sales opportunities and entire markets. While American manufacturers were restricted from selling in certain countries, foreign organizations moved in and also became more aggressive in the United States.

Currently growth is confined to the turbine-powered airplane markets, whereas we find many markets closed to us in piston engine airplanes. A shortage of new pilots is beginning to show because schools abroad find it difficult to survive the higher costs imposed by the price of aviation gas and inflationary factors. If fewer new pilots come into the system the effects will eventually be felt on other airplane types for corporate or other uses.

We do not believe in panicking every time political and economic conditions arise which impact our international business. The ups and downs are part of the scenario. Experienced organizations are resilient enough to find solutions. If it costs a German customer today 60 percent more to buy an airplane than it did a year ago we have to see this in the context of more favorable conditions earlier when the dollar was low. We prefer to view the current conditions in their long-range effects on the U.S. national interest. We believe they are positive even if we have to work harder now. Eventually, the result will be to depress the rate of U.S. inflation which in the past had pushed up our prices.

We are in tune with the Reagan administration. We benefit from the enhanced posture of the United States abroad and the respect in which our country again is held. These benefits are intangible, but they are real to us who have lived through the years in which the United States was held in contempt. The Reagan administration is responsive to business needs and this has been demonstrated as already many of the disincentives of previous administrations have been dismantled. Also, the Exim Bank was restored to a position where it again can be an effective tool for this country to be competitive in world markets.

Therefore, from an international standpoint, we at Beech would list as the most urgently needed measures:

First, we believe that the principle of fair trade should be enforced. The civilian aircraft agreement of the multinational trade agreements should be binding on all countries which compete with us in general aviation.

Second, the International Civil Aviation Organization attempted to develop complete reciprocity in airworthiness certification requirements. This was never accomplished. Proliferating special certification requirements which now exist have substantially increased development costs and the cost to consumers. Congress should mandate a review and revision of international certification requirements with the objective of complete reciprocity in every jurisdiction represented in ICAO.

Third, general aviation manufacturers have substantial investments in the development of commuter-type aircraft. It is a growing market. Competition now from the United Kingdom, Canada, Brazil, France, Italy, Japan, Spain, Sweden, Indonesia, Israel, all aim at that market. Many of these aircraft have the benefit of government subsidies in development and production phases and are marketed under liberal finance terms or offsets. The multinational trade agreements could be one vehicle to restore a reasonable competitive fair trade balance.

If this cannot be accomplished Congress should mandate the administration to take measures which are legally available now in the United States. Investment tax credits or FAA loan guarantees should be denied foreign products which are offered under terms that violate principles of fair trade.

Fourth, the Export-Import Bank should be provided with necessary funds and individual sales ceilings lowered to effectively support general aviation exports including military trainers and special mission airplanes.

Fifth, the Security Assistance Act is up for renewal; restrictions on military sales to Argentina and Chile should be lifted without limitations, especially as they still apply to general aviation.

Sixth, the Foreign Corrupt Practices Act has been difficult to administer. We believe the Chaffee bill introduces reasonable reforms without abandoning a principle. We believe standards of business conduct should not be unilaterally imposed on U.S. business, but should be made the subject of multinational treaties. Until this can be achieved, we recommend the Chaffee bill be passed as proposed.

Summing up, we feel the Government can move further to insure a more favorable climate in which to conduct business. A progressive step was made with the signing of President Reagan's program for economic recovery. Specifically:

Basic research and development activities aimed at providing more fuel efficient general aviation aircraft should receive a greater priority within the framework of less Government spending and taxes.

The Nation's airport and airway system should be enhanced recognizing the tremendous role general aviation plays in the Nation's air transportation system.

More and better equipped reliever airports are a must.

We support Senate bill 1272 which provides for financing of these improvements and a reduction to the unspent surpluses held in the aviation trust fund.

We urge Congress to consider specific remedies we mentioned to restore competitive equality and encourage fair trade practices.

Our industry faces many challenges to its growth. We do not want the Congress to subsidize our operations like those of our foreign competitors. We do want Congress to create a business environment which allows us to compete in the market reflecting the realities of international commerce. If countries erect barriers to free trade then we must deal with those barriers from economic strength. We have great products. We need an opportunity to be able to sell them in world marketplaces unhindered by unfair trade practices of other countries or at home.

Thank you.

Senator **Kassebaum**. Thank you, Mr. Neuburger.

Mr. **Lair**. I am Robert L. Lair, senior vice president and director of Cessna Aircraft Co. I also serve as a director of Cessna International Finance Co. and as a director of Reims Aviation, our affiliate in Reims, France.

To tell you a little bit about our company, Cessna Aircraft Co. has for 11 years manufactured over 50 percent of the total general aviation airpanes made in the United States and has exported between 25 and 30 percent of those airplanes each year.

In our fiscal year 1980, our total sales were $1 billion, and we expect to at least equal those sales this year. We employ 15,500 people in our U.S. States operations and have a total payroll of $275 million. We have approximately 3,200 suppliers in large and small businesses in the United States and overseas. And I might add, many critical components of our aircraft are imported from Brazil, Canada, and other international suppliers.

For many basic economic reasons, the general aviation business has been retrenching for the last 2 years. As an example, in 1980, Cessna's U.S. employment was 21,500 or 6,000 more wage earners than we have employed today.

General aviation is not suffering any more than any other hard-goods industry in the general malaise of the worldwide economic climate.

We are, however, being severely injured by unfair and inequitable competition from other countries selling aircraft in the United States and other countries in the world.

This unfair competition takes the following forms: Reciprocal licensing agreements are not honored by other countries. Competitive international manufacturers are heavily government subsidized in design and development and production costs. These subsidies amount to millions of dollars. In the case of Canada, the Canadian Government will have guaranteed more than $400 million in loans for the Challenger. Many countries are developing commuter aircraft such as the Short 330 in the United Kingdom and the Brazilia in Brazil. Each of these represent a multimillion-dollar subsidy by their governments. The significant fact about these developments as well as those in Japan, Israel, and others is that the primary market is the United States. Practically none of these developments could be justified based on an "in country" market. Competitive international manufacturers have government-supported financing arrangements that allow them to offer sales in the United States and overseas at ridiculous terms—no down payment, 8½ percent interest rates, delayed initial payments up to 2 years, and other uneconomic terms.

The crowning blow, however, is the assistance and economic support furnished by the United States for these manufacturers.

The FAA has generally quickly accepted reciprocal licensing with minimal special conditions and at little or no charge to international manufacturers. In at least one case, a complete FAA team was furnished onsite to assist an international competitor to certify their product in the United States.

The international manufacturers are currently eligible for FAA-guaranteed loans on their products.

The international manufacturers' products are currently eligible for the investment tax credit.

There is no duty on aircraft imported in the United States regardless of whether the competing nation is a signatory to the trade agreement on civil aircraft or not.

In short, in addition to the subsidies given by the other governments, the U.S. Government also subsidizes international aircraft product sales in the United States.

I know you have been told that international aircraft sales in the United States are not significant and that the number of units is a small fraction of the U.S. market. To some extent, this is true—the number of units is not large—but let me attempt to put this into proper context for you: The sale of one $3 million turboprop if we figure $50,000 in sales per employee, represents 60 jobs. If 300 foreign airplanes are sold in this country in the next 5 years, that is equivalent to 18,000 jobs at the airframe manufacturers alone. We estimate that for every airframe job, there are at least five other people employed in associated industries. If this is correct, we are talking about the loss of 90,000 potential jobs in the United States.

International aircraft sales in the United States are significant and have a lasting job impact over the long term.

Our industry is not interested in direct Government subsidies in any form, either for design, development, tooling manufacturing, or financing. We are willing to compete openly in any market, domestic or international, and pay our own bills—as long as we have the Government's support in maintaining an equitable basis for selling our products.

The basic rule should be "quid pro quo." What does this mean in practical terms? It means that: Only those who have signed and abide by the terms of the GATT Trade Agreement on civil aircraft should receive the benefits afforded by those agreements. In short, if a nonsigning nation applies duties or special taxes to U.S. aircraft on importation, the same duties should be assessed on their aircraft products imported into the United States. If our aircraft products are embargoed by another country—we should shut off importation of their aircraft products into the United States.

International manufacturers who engage in predatory financing practices with assistance of their government should be ineligible for FAA loan guarantees and the investment tax credit. The terms offered in the United States should not be less than the best terms offered by independent banks and finance companies in the United States on U.S. aircraft loans.

We should stop leaning over backward to certify international products in the United States. If another government charges U.S. manufacturers to certificate our aircraft products in their country, identical charges should be made to certificate their products in our country.

Under the reciprocal agreements, it should be a "rubber stamp" operation to certificate our products in another country. Special conditions preventing reciprocal certification should be eliminated.

A meaningful reciprocal agreement should be a mandatory prerequisite to certification of an international manufacturer's product in the United States, that is, no reciprocal agreement—no certification.

We recognize that what we are recommending would be a considerable change in attitude on the part of the government, but it is a vital necessity if we are to maintain our competitive stance and stop subsidizing foreign competition in the U.S. market.

We have all seen the results in other industries of overencouraging unfair and inequitable competition.

We are not asking for protection and subsidies—we believe our industry can meet any competition in engineering, manufacturing know-how and pricing. All we are asking is that our Government cease subsidizing international manufacturers and enforce the terms of our international agreements.

Thank you.

Senator **Kassebaum**. Thank you.

Mr. **Stimpson**. Thank you very much, Madame Chairman and Mr. Chairman. To start with some good news: Today I have just finished a trip across the United States, leaving Washington, D.C. about 10 days ago in a single engine aircraft. We went to the Pacific Northwest. We went to California. We put about 45 hours on that airplane in 10 days. I am telling you the air traffic control system worked beautifully. We tried to follow our own advice of the agreement that we reached with FAA a few days ago. We went VFR whenever we could. We went nonpeak hours whenever we could. We stayed out of the big metropolitan hubs whenever we could. And we just got excellent service. We did go IFR a couple times when we got into some weather. But I am telling you, service could not have been better. You have heard this morning about how our leadership in aviation is being challenged. You have heard a number of examples cited, countries like England, Canada, Brazil, France, Italy, Brazil and others who have demonstrated their willingness to spend hundreds of millions of dollars subsidizing aircraft development targeted primarily at the U.S. commuter and business jet markets. This is further demonstrated by highly subsidized financing programs, including no down payments and very low rates of interest currently being offered to U.S. customers. U.S. manufacturers depend on the private sector for financial assistance but simply cannot match such government subsidized programs. We are feeling this impact. We will feel it greater in the years ahead.

In 1978, the U.S. general aviation industry delivered 17,811 aircraft. By 1980, deliveries were down to 11,877, and for this year, the industry will deliver less than 10,000—a drop of over 40 percent from just 3 years ago. To date, deliveries of higher performance and higher price aircraft have maintained stability in some sectors of the industry. However, other segments of the industry, including manufacturing, sales and service organizations have been severely impacted and this has been reflected in both reduced sales and significant employment layoffs.

The current state of the U.S. economy has had a major negative impact upon the general aviation industry. High interest rates, lack of available financing and uncertain business conditions have taken their toll. The passage of President Reagan's economic recovery program and the policies for stimulating business should have a positive influence on domestic sales.

Exports, however, are a key factor in the health of the U.S. general aviation industry. Historically, the industry has exported about a quarter of its production and in some years it has been over 30 percent. In 1981, the industry will export less aircraft than at anytime since 1972.

The strengthening of the dollar abroad, worldwide inflation and recessionary economics have been part of the reason. Equally important, there have been trade barriers erected by some nations for protectionistic purposes.

The general aviation industry vigorously supported the Agreement on Trade in Civil Aircraft as part of the Multilateral Trade Negotiations. This Agreement called for the reduction of tariffs to zero and the elimination of nontariff barriers. Unfortunately, some major aircraft-producing nations are not complying with the Agreement's provisions, while others have not even signed it. Yet, aircraft from these nations can be sold freely in the United States, while sales of U.S. aircraft in some nations are severely restricted by their trade policies. This is patently and grossly unfair.

Our Government must take the lead in assisting U.S. industry in these trade matters, since it is foreign governments that are taking these actions. The U.S. Government, with industry assistance, negotiated the Agreement on Trade in Civil Aircraft; it is up to our Government to enforce its principles of free and fair trade. You have heard about the three types of unfair trade practices we are facing: First, limited access to certain foreign markets. Second, low interest, long-term foreign government-subsidized financing packages for sale of aircraft, both in the United States and abroad, while United States as well as potential foreign customers must pay current market rates for U.S. products. Third, government-to-government trading in third countries, which causes the loss of sales of U.S. products.

Both Mr. Lair and Mr. Combs referred to the term "quid pro quo." This is not an outmoded term. It should be a precept in international trade. Nations that sell in the United States should be signatory to the aircraft agreement and comply with its provisions for free and fair trade.

Arguments that some nations are exempt because of developing nation status or because they are purchasing other U.S. aviation products must be regarded as excuses for not agreeing to the provisions of free and fair trade and for remaining protectionistic with various trade barriers.

In technology development, I was very pleased with the statement of Dr. Mark this morning. I believe this is the most positive statement regarding general aviation that I have heard from any NASA official in the time I have been in Washington. He frankly said they are not doing enough. Most of the time you hear the arguments of why the budget has to remain low. I am not here advocating a huge new expanded NASA aeronautics budget for general aviation today. We all know the budget pressures. But we are asking for a reordering of priorities, doing some of the things that have been advocated by NASA's advisory committees. He submitted for the record the Woods Hole Workshop which is an excellent document as to what should be done, put together by the top experts in the industry. So I was very encouraged by his testimony. I hope that what he said will soon come true.

In summarizing the recommendations that our industry is making: First, we believe the trade agreement for civil aircraft should be a document which sets the precepts for the decade of the 1980's. Appropriate enforcement mechanisms should be developed whereby nations who choose not to participate or comply with its provisions are not allowed to reap the full benefits in the United States. Secondly, the aircraft loan guarantee program should be renewed next year, but on a more flexible basis to be of greater assistance to U.S. commuter operators. This program should facilitate the purchase of U.S. aircraft and should not serve as a subsidy to foreign aircraft manufacturers.

Third, the programs of the Export-Import Bank should be available to assist in the sale of small aircraft as well as large. In 1980, direct loans for only two general aviation aircraft were provided by the Export-Import Bank.

Fourth, I was very pleased to hear Senator Kassebaum talk this morning about general aviation user charges. The administration should drastically revise its current proposals on aviation user charges. While general aviation users are willing to pay part of the costs of the airport/airway system, charges must be fair and reflect a reasonable assessment of the public benefit of the airport/airway system.

Fifth, NASA programs on general aviation should be oriented toward meeting the recommendations of its advisory committees in a timely manner. Lower priority programs should be discarded.

Sixth, meaningful international agreements should be reached regarding the financing of general aviation and commuter aircraft. The recent announcement by the Treasury Department and Export-Import Bank regarding the 12-percent agreement on large transport aircraft is an important first step.

We are heartened by recent communications of the Treasury Department that they will vigorously pursue international agreements in the area of general aviation aircraft financing. We are encouraged by recent commitments by Ambassador Brock, Senator Kassebaum, Congressman Glickman, Congressman Benjamin, and others to take an active role in seeking resolution of the general aviation trade problems. We would hope that many problems faced by the general aviation industry could be solved by mutual cooperation, not confrontation. However, the challenges facing our industry are indeed significant and they will require imagination and determination to be satisfactorily resolved. GAMA stands ready to work closely with the Congress and other governmental departments and agencies in seeking prompt solutions to these vexing trade problems.

As an industry, we can compete in a fair and open marketplace. We only request that such an environment be provided.

[The prepared statement of Mr. Stimpson follows:]

General Aviation
Manufacturers Association

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(202) 296-6540

STATEMENT OF
EDWARD W. STIMPSON, PRESIDENT
GENERAL AVIATION MANUFACTURERS ASSOCIATION
BEFORE THE
HOUSE SCIENCE AND TECHNOLOGY SUBCOMMITTEE ON TRANSPORTATION,
AVIATION, AND MATERIALS
AND THE
SENATE COMMERCE, SCIENCE AND TRANSPORTATION
SUBCOMMITTEE ON AVIATION
WICHITA, KANSAS
AUGUST 27, 1981

I am Edward W. Stimpson, President of the General Aviation Manufacturers Association, an independent trade organization representing 38 companies that manufacture general aviation aircraft, engines, avionics and component parts.

We appreciate the interest of both of your Committees and the opportunity to testify. The issues of trade and technology are of vital concern to the future of the general aviation industry, and a hearing on these interrelated topics is timely and appropriate.

The U. S. general aviation industry has maintained a position of leadership in the world's air transportation system. On practically every airport throughout the world, there is a U. S. manufactured general aviation aircraft, and a high probability that the aircraft was manufactured in Wichita, since over 60 percent of the world's general aviation fleet is produced here. Our technical superiority and historical ability to succeed in competitive, open markets have been major factors in our world position.

This leadership is being challenged, however. Numerous foreign governments, including England, Canada, Brazil, France, Italy, Japan and others, have demonstrated their willingness to spend hundreds of millions of dollars subsidizing aircraft development and production programs targeted primarily at the U. S. commuter and business jet markets. Their aggressiveness is further demonstrated by highly subsidized financing programs -- including no down payments and very low rates of interest -- currently being offered to U. S. customers. U. S. aircraft manufacturers, who depend on the private sector for financial assistance, simply cannot match such government-subsidized programs.

The impact is now being felt. Many of our foreign competitors have already achieved a favorable balance in general aviation trade. With new aircraft coming into this country from Japan, France, Israel, Canada, Brazil and the United Kingdom, we can anticipate even greater challenges to U. S. airframe manufacturers.

In 1978, the U. S. general aviation industry delivered 17,811 aircraft. By 1980, deliveries were down to 11,877, and for this year, the industry will deliver less than 10,000 -- a drop of over 40 percent from just three years ago. To date, deliveries of higher performance and higher price aircraft have maintained stability in some sectors of the industry. However, other segments of the industry, including manufacturing, sales and service organizations have been severely impacted and this has been reflected in both reduced sales and significant employment layoffs.

The current state of the U. S. economy has had a major negative impact upon the general aviation industry. High interest rates, lack of available financing and uncertain business conditions have taken their toll. The passage of President Reagan's Economic Recovery Program and the policies for stimulating business should have a positive influence on domestic sales.

Exports, however, are a key factor in the health of the U. S. general aviation industry. Historically, the industry has exported about a quarter of its production and in some years it has been over 30 percent. In 1981, the industry will export less aircraft than at anytime since 1972.

The strengthening of the dollar abroad, worldwide inflation and recessionary economics have been part of the reason. Equally important, there have been trade barriers errected by some nations for protectionistic purposes.

The general aviation industry vigorously supported the Agreement on Trade in Civil Aircraft as part of the Multilateral Trade Negotiations. This Agreement called for the reduction of tariffs to zero and the elimination of non-tariff barriers. Unfortunately, some major aircraft-producing nations are not complying with the Agreement's provisions, while others have not even signed it. Yet, aircraft from these nations can be sold freely in the United States, while sales of U. S. aircraft in some nations are severely restricted by their trade policies. This is patently and grossly unfair.

The U. S. Government must take the lead in assisting U. S. industry in these trade matters, since it is foreign governments that are taking these actions. The U. S. Government, with industry assistance, negotiated the Agreement on Trade in Civil Aircraft; it is up to our Government to enforce its principles of free and fair trade.

U. S. manufacturers are basically facing three types of trade problems:

1. Limited access to certain foreign markets.

2. Low interest, long-term, foreign government-subsidized financing packages for sale of aircraft, both in the U. S. and abroad, while U. S. as well as potential foreign customers must pay current market rates for U. S. products.

3. Government-to-Government trading in third countries, which causes the loss of sales of U. S. products.

Our government should be active in all three areas. We are pleased that the Office of the U. S. Trade Representative will be holding bilateral negotiations in the near future with certain countries. Moreover, the Treasury Department has stated its intent to work with the general aviation industry in attempting to solve the export subsidy issue for foreign aircraft competing with U. S. products both in domestic and foreign markets.

Our government must also take action with nations who close their markets to U. S. products or restrict access. "Quid pro quo" is not an outmoded term; it should be a precept in international trade. Nations that sell in the United States should be signatory to the Aircraft Agreement and comply with its provisions of fair trade. Arguments that state some nations are exempt, because of their "developing nation status" or because they are purchasing other U. S. aviation products, must be regarded as excuses for not agreeing to the provisions of free and fair trade and for remaining protectionistic.

Technology Development: Currently, less than three percent of NASA's Aeronautic Budget, or less than $8 million, is requested for general aviation technology. NASA has some unique capabilities, including its personnel and facilities, to assist the general aviation industry at a relatively low cost. The needs of the industry are well known. Recommendations for action have been submitted to NASA through advisory panels, Congressional Hearings and numerous meetings and workshops. The National Academy of Sciences report emanating from the Woods Hole Workshop last year again spells the needs out in detail.

In the past, some recommendations have been accepted by NASA, and programs have been undertaken with beneficial results. In other instances, we have seen little or no progress. NASA must play an important role in helping the U. S. maintain its leadership position and many of its technical projects can be accomplished at a relatively modest cost to the taxpayer. In some cases, a reordering of current programs and priorities may be necessary.

Foreign governments are expending considerable effort on technology development. This is seen in new products now entering the marketplace. Government-sponsored research in such areas as composites will be of considerable future aid to foreign manufacturers.

Recommendations

A number of steps could be taken by the U. S. Government to assist the general aviation industry. Specifically:

1. The Agreement on Trade in Civil Aircraft establishes ground rules for fair trade. Appropriate enforcement mechanisms should be developed whereby nations who chose not to participate or comply with its provisions are not allowed to reap the full benefits of the agreement by selling their products in the United States.

2. The Aircraft Loan Guarantee Program should be renewed next year, but on a more flexible basis to be of greater assistance to U. S. commuter operators. This program should facilitate the purchase of U. S. aircraft and should not serve as a subsidy to foreign aircraft manufacturers.

3. The programs of the Export-Import Bank should be available to assist in the sale of small aircraft as well as large. In 1980, loans for only two general aviation aircraft were provided by the Export-Import Bank.

4. The Administration should drastically revise its current proposals on aviation user charges. While general aviation users are willing to pay part of the costs of the airport/airway system, charges must be fair and reflect a reasonable assessment of the public benefit of the airport/airway system.

5. NASA programs on general aviation should be oriented towards meeting the recommendations of its advisory committees in a timely manner. Lower priority programs should be discarded.

6. Meaningful international agreements should be reached regarding the financing of general aviation and commuter aircraft. The recent announcement regarding the 12 percent agreement on large transport aircraft is an important first step.

We are most encouraged by recent commitments by Amabssador Brock, Senator Kassebaum, Congressman Glickman, Congressman Benjamin and others to take an active role in seeking resolution of the general aviation trade problems. We would hope that many problems faced by the general aviation industry could be solved by mutual cooperation, not confrontation. However, the challenges facing our industry are indeed significant and they will require imagination and determination to be satisfactorily resolved. GAMA stands ready to work closely with the Congress and other governmental departments and agencies in seeking prompt solutions to these vexing trade problems.

As an industry, we can compete in a fair and open marketplace. We only request that such an environment be provided.

Senator **KASSEBAUM**. Thank you, Mr. Stimpson. Ms. Lehman.

Ms. **LEHMAN**. I have stood behind this podium so many times, I feel comfortable here. Senator Kassebaum, Congressman Glickman, and Congressman Williams. You may relax. The stack of papers you saw in my hand contains some reports I want to introduce into the record. I assure you I am not going to read through all of them.

Senator **KASSEBAUM**. They will be a matter of record.

[The information follows:]

The European Aerospace Industry and its future

By Felice Calissano, SORIS , Italy

The author of this article, Mr. Felice Calissano, is general manager of the SORIS Co Ltd, a private company engaged in market research and economic studies. SORIS recently completed a study for the European Economic Community Commission described as " a comparison between the aeronautical and space travel industries of the European Economic Community and those of Great Britain and the United States". The research lasted for a period of about two years and during this time the SORIS team of six full-time researchers headed by Mr. Čalissano, was assisted by Professors Frederico Filippi and Gianni Jarle of the Turin Polytechnic. The work involved in the study has given the SORIS team a close acquaintance with many diverse features of the European and US aerospace industries. In this article Mr. Čalissano comments on some of these features.

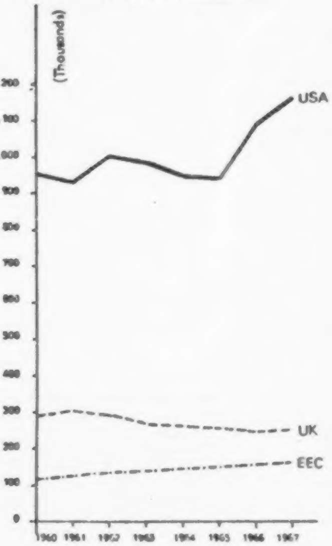
The economic role of the aerospace industry

Since the aerospace industry makes use of the most diverse and advanced technology, and as it is closely tied to many other sectors of industrial activity, its development, in the majority of cases, affects industry as a whole, and leads to higher standards. This influence can be both direct and obvious, but it generally manifests itself in a more subtle fashion and, in fact, affects the industrial sectors which are apparently completely divorced from aerospace.

It is in the United States that, by virtue of the vast amount of effort devoted to the subject, the effects of the aerospace activities make themselves most strongly felt in the industrial field and on the economy itself. It can be seen there that modern management methods developed for undertaking large-scale aerospace programmes involving the work force and resources of hundreds and even thousands of firms, are being readily adapted in other sectors of the industrial field. It is by the introduction of such planned management techniques that programmes can be completed within a balanced time-scale. Apart from the technological 'fall out' of the aerospace industry's activities, the great contribution this industry makes to the rest of the economy as far as the aerospace industry's importance per se as well as its quantifiable importance is concerned, should be pointed out. On the general economy as a whole, one of these characteristics has a stabilising and stimulating influence. We refer of course to the size of long-term investment, either public or private, which the aerospace industry needs.

It can be affirmed that up to the present time, as the public intervention lacked both force and persistence in the research and developments fields, as well as in production, Europe could not or would not benefit from the fresh problems raised by the aerospace era, to activate its development, to increase its fall out technology and to direct its investments in relation to the economic cycle in the sophisticated sectors, by advanced planning over several years in order to obtain the very best economical results.

Aerospace industry work-force in thousands



Research and development (R & D) activity

The joint initiative of both State and private enterprise is essential for the development of the aerospace industry. It is, however, governmental policy which decides the size and direction of this development, above all in the military and space fields and in Europe, in civil aircraft manufacture. When government research and development contracts pass a certain level, the firms concerned have the capability to organise their own research capabilities, thus increasing their efficiency and profitability. It is also of the utmost importance that all the parties concerned are in agreement with the direction of the long-term planning; that division of contracts amongst the smaller firms is avoided; that industry be in a position to profit from the research and development programmes.

There is however a wide gap between the expenditure on aerospace research and development in the United States and Europe, no matter whether we compare the amounts spent, or the relationship between the amount spent and the Gross National Product (GNP), or whether we compare the sums spent on aerospace R & D with the money spent on research and development as a whole:

Country	Invest. in aerospace research in 1967 (m. dollars)	Percentage of the GNP in 1967	Percentage of total invest in research in 1966
EEC	841	0.28	13.8
GB	688	0.62	28.9
USA	10,482	1.30	45.7

The high percentage of public funding (about 90%) in relation to the total investment in research and development explains the overriding governmental influence in the direction of research. Whilst the funding of military aerospace and space programmes is almost entirely controlled by the State, in the zones that we are considering the European governments intervene far more strongly than their American counterpart in the funding of commercial aerospace programmes as the table below, referring to the period 1960-1967, shows clearly:

Country	Public funding $ (million)	%	Private invest. $ (million)	%	Total invest. $ (million)	%
EEC	477	58.2	343	41.8	820	100
GB	428	45.6	310	54.4	938	100
USA	335	7.2	4294	92.8	4629	100

European firms, because of their size, are incapable of carrying out research programmes on their own, no matter how small the programme may be, so the State is bound to intervene. It should be noted in this context that in the United States research into military projects often leads to a civil product, for example the Boeing KC 135. Furthermore, the American government will directly fund the SST programme. Regardless of this direct or indirect intervention of the US government, the EEC and United Kingdom firms have only allocated to civil aviation programmes, between the years 1960 and 1967, funds totalling respectively 8.6 per cent and 11.8 per cent of the monies put up by American manufacturers.

Another characteristic of the US civil aerospace research, which unquestionably contributes to the success of these enterprises, is that they spend a large part of their R & D funds on marketing, which in turn leads to large and profitable series production and hence draws the maximum benefit from the money invested in the research and development activities. The following table, which compares the funds invested in R & D with the value of the products, shows the profitability of the funds invested in R & D:

Programmes (% of total expenditure)	EEC Civ.	EEC Mil.	GB Civ.	GB Mil.	USA Civ.	USA Mil.	Aviation Total
Research expenditure in aerospace industry	49	29	33	28	19	34	11
Production expenditure of aerospace industry	51	71	67	72	81	66	89

In Europe the profitability level of investments is obviously insufficient, particularly in civil aircraft manufacture. This stems from the fact that both civil and military programmes often progress no further than the prototype stage and that series production is not large enough.

It is of interest to relate the total expenditure for research and development and the labour force of industries in the three zones under consideration. This shows 3,579 dollars per employee in the EEC against 1,877 dollars in Great Britain and 5,958 dollars in the United States.

The aerospace industry

This is an industry which possesses a worldwide market. It is therefore quite in order to compare the aerospace industries of the three zones concerned. In the United States growth is engendered by higher governmental funding and by sales to other countries. In the case of the EEC, growth, which may appear satisfactory at first glance, is largely due to increase of purchases and contracts by the government. In the United States progress is accompanied by a reorganisation of the sector which results in:

- nearly optimal size of firms;
- division of risks between military and civil production;
- integration and programming of public and private investment over the long term;
- larger firms organising the system of subcontractors;
- specialisation by manufacturing companies in certain types of products;
- reduction in timescale, e.g. development of Boeing 707 took six years as against the three and a half years needed to develop the Boeing 747.

On the other hand evolution in Europe has manifested the following characteristics:

- with the exception of France, investment of public funds has only been on a spasmodic basis and has never been directed towards programmes having an important bearing on the reorganisation of the industries;
- fluctuating demand has checked firms' development and hindered specialisation; within the aerospace firms it has also been necessary to maintain a constant level of employment;
- the process of concentration has been introduced at the economic/financial level and not at production level;
- European firms, being unable to attain sufficient size, show insufficient profit levels, which in turn prohibit them from accumulating sufficient reserves, either financial or in the work-force field;
- as a result of all this, it has proved quite impossible to equate the risks between military and civil production and to specialise; collaboration has not prevented the use of two or even three similar assembly and production lines;

  the delay in marketing is of the atmost importance. The value of production and the productivity per person is 1.95 and 1.99 times higher in the United States than in the EEC and 2.84 and 2.90 times higher than the corresponding figures for the United Kingdom, whilst the cost per employee in the United States is more than 1.79 times that of the EEC and 2.6 times that of the United Kingdom.

In this context, the only positive element in favour of the European aerospace industry is the lower cost of the labour force. It should be noted however that between the years 1959 and 1966 the cost of the labour force in the European aerospace industry has gone up by 78 per cent, by 48 per cent for the United Kingdom work force as against a rise of only 31 per cent for the United States aerospace industry labour force.

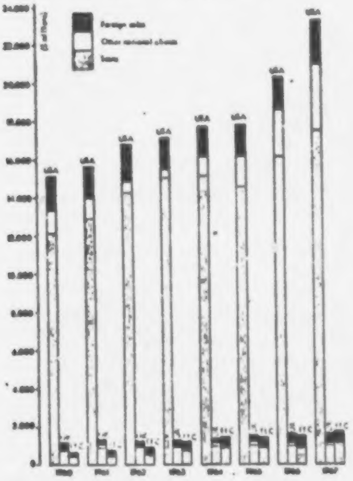
The civil aviation market

At world level, 83 per cent of aircraft in service in the year 1968 and 87 per cent of those that were the subject of orders, are or are being, manufactured in the United States, against a mere sixteen per cent in Europe.

In the United States the domestic market for commercial aircraft, which is baiscally satisfied by US companies ($3,503 million in 1967 against $46 million in the EEC and $165 million in the United Kingdom for the same period) is large, but is only in the order of 15 per cent of the total turnover of the American aerospace industry (against 2.6 per in the EEC and 10.2 in the United Kingdom). The American market, which, in 1968, represented 62 per cent of the aircraft in service in the world (excluding the Eastern European countries), is characterised by:

- a vast range of products capable of covering (today at least), all sectors of the world civil aviation market, whilst the European production is chiefly for short and medium range aircraft;
- the right size firm and proper equipment which permits the production of a long series of aircraft at a higher rate of production and lower costs than those offered by the European aerospace industry, and which offers the possibility of satisfying the demands of the airlines within a most acceptable time frame;
- a high degree of reliability of both firms and their products.

Aerospace Industry turnover (in $ million)



The European Firms have not succeeded in organising themselves at the same level, but they can well profit by becoming organised for the favourable period that lies ahead. In effect, the forecast by SORIS for the period 1968-1980 (see box) shows a world-wide civil aviation market (excluding the socialist countries), in the neighbourhood of $90 thousand million (at 1967 pric [illegible] and a grand total of some 7,389 aircraft. Moreover, during the course of 1970 the demand for civil aircraft will diversify. European manufacturers will be able to benefit from this tendency, since they hold a leading position with some very promising designs, to mention a few—in addition to the short and medium range aircraft—the supersonic and the short and vertical takeoff and landing aircraft.

The military aerospace market

The value of military aircraft of the EEC, the United Kingdom and the United States has been estimated at the end of 1967 as being respectively $10,726 million (excluding France's strategic command), $5,083 million and $40,650 million (excluding non-ballistic missiles), 87 per cent of the world value of military aircraft of the three zones is of American origin, 8.5 per cent is of European origin whilst 5.8 per cent is of English origin.

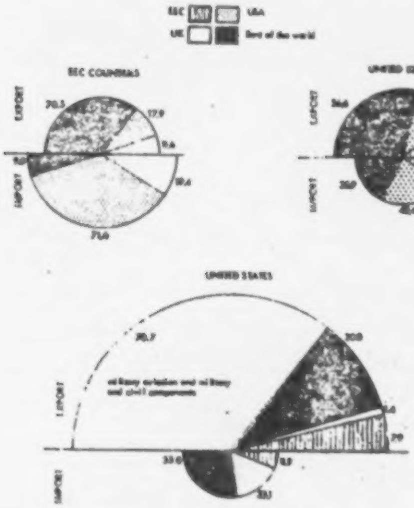
> The military and civil aviation markets for the period 1968-1979 have been estimated in accordance with numerous projections. We can only highlight the more important ones.
>
> **The civil market**—The demand analysis has been carried out by country and by aircraft type. We have considered the size of the aircraft fleets and orders by country or groups of countries at the end of each year for the period 1958-1967. Traffic (passenger, freight and mail) has been analysed by region and by route (in Europe also by individual countries). The forecast growth of passenger and freight traffic has been related to that of present-day aircraft types and their operational and technical characteristics and to future orders for the same period under consideration, in order to obtain an estimation of the civil aircraft requirement on a world-wide basis for the period 1968-1979. This requirement has been divided up by region or country.
>
> **The military market**—We have assumed that defence expenditure for the various countries will either remain at values attained in 1967 or will represent a constant percentage of the national revenue. The declared statements of intent made by responsible ministries have also been taken into account. It is estimated that the armed forces of the various countries concerned will replace their out-of-date equipment by an equal operational capability and not numerically. This supposition makes the point that there will be no severe international crisis within the countries concerned, and that the defence of the EEC counries will remain within the framework of NATO

If one supposes that the armed forces of the various countries maintain a constant level of operational efficiency, there must be a world-wide market for the European aerospace industry, excluding electronics, in the region of $15,400 million for the period 1968-1980.

Import and export of aviation equipment

While for America and Great Britain the volume of imports is secondary, the value of aviation equipment imported by the Common Market countries from other countries during the period 1960-1967 corresponds to 34 per cent of their production and 30 per cent of their domestic market. The number of aviation programmes carried out under licence (notably from American firms) by EEC firms shows their dependence up sharply, the only exception being France, which has developed its own programmes and collaborated with other countries. This situation has of necessity exercised a negative effect on exports; one can point to very few EEC aviation programmes (France apart) which have succeeded in getting expert orders outside the EEC (Fig. 4). Contrary to what has just been stated for the EEC, France, from 1969 onwards, has been able not only to satisfy its military needs, and to a certain extent, its civil requirements, but has also launched a most effective export policy.

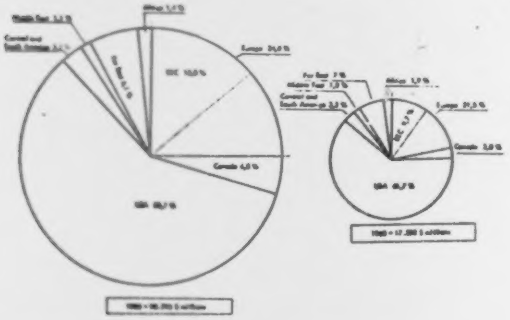
Import and export by countries in zones in the 1960-1967 period



Possibilities for the future of the EEC aerospace industry

The State is by far the largest client of the EEC aerospace industry and in fact took 65.3 per cent of production in 1967. Research and development for the same year was covered up to 89 per cent by public funding. State investment in firms' capital varies in amount by countries but is particularly large in both France and Italy. All conditions exist therefore to introduce the principles of planning of investments, production and demand. This leads to an increase in efficiency comparable to that of the United States aerospace industry.

Value of turbojet/turboprop aircraft in service in 1968 and 1980 (forecast)



Public funding of aerospace projects is closely related to the GNP and can usually be forecast. The technological capacity of firms is proven and the basic needs of the EEC military market can be met by the European aerospace industry. Airlines will use many different types of aircraft and so there is an excellent opportunity for the European aerospace industry to get into markets in sectors more compatible with their size.

A policy of options for a limited number of aircraft types should therefore be introduced into the EEC which in turn will allow the manufacture of a large series of aircraft, enabling production to become competitive on an international level. These options can be changed to fit in with the reorganisation of the EEC aerospace industry.

On the other hand future plans for reorganisation should take into account aerospace plans which are already in being and above all the international programmes. It should be noted that, despite their importance, theire international programmes have not resulted in any mergers, up to now, at European level. The task of reorganising the EEC aviation industry with a view to making them, by virtue of their size and speciality, capable of competing on an international basis, could be carried out with the concerted and balanced governmental aid. This could be achieved by concentration on a transnational level or in a more selective manner, by reinforcing the more important existing firms in order to enable them to attain the most favourable size. ☐

Rowland Evans and Robert Novak

Vying With 'France, Inc.'

Eastern Airlines plans to sign the purchase agreement this week for 23 European wide-bodied airliners, a deal that not only delivers another stunning blow to the American dollar but also raises serious questions of U.S. industrial survival in the world of subsidized foreign exports.

The A300 airbus is an excellent plane, but that's not why Eastern is buying it. Airbus Industrie, a Western European combine, made an offer that Eastern Chairman Frank Bormann could not refuse. The price was right because Airbus Industrie is subsidized by the French government, one of its principal owners.

Although the Europeans cannot match the Americans in cost-efficient production of commercial airliners, they are spoon-fed government funds to compete in the world market. In the case of the Eastern Airlines deal, the French taxpayer enables planes to be sold far below cost. What makes that dangerous for the United States—and the dollar—is its threat to aerospace exports, one of the last places where Uncle Sam still keeps his head above water in international trade.

This is not the ancient conflict between free trade and protectionism. Rather, the model of Japan, Inc., is being duplicated in Western Europe (France, Inc., in the airbus deal). Here is a neomercantilist system against which American companies are helpless playing by Adam Smith's rules.

Typically, this overpowering problem has not been addressed at policymaking levels of the Carter administration. But almost by accident, it is coming to the attention of worried congressmen. A warning signal was sounded at a House Banking subcommittee hearing March 17 by J. B. L. Pierce, treasurer of the Boeing Company: "We can compete with Airbus and the other European aircraft manufacturers on cost and technical merits, but we cannot compete with the national treasuries of France and Germany and other European countries."

Rep. Jim Leach of Iowa, a 35-year-old freshman Republican with no aerospace interests in his district, took notice. That very day, Leach wrote the subcommittee chairman, Rep. Stephen Neal of North Carolina, urging a close look at Eastern's French connection: "We could be witnessing the emergence of a kind of international trade warfare that has nothing to do with economic competition, but rather with the skill of individual governments to establish reverse trade barriers."

Leach, Neal and other congressmen want to see the fine print of the Eastern deal—a closely guarded secret up to this point. Apart from details, however, the subsidy for each A300 in the Eastern package is estimated at $10 million.

The French subsidy system is revealed by a 1976 French parliamentary report. The government "loan" of $386 million covers half of airbus production, with repayment indefinitely halted at $2.5 million, or 0.7 percent. The report vigorously argues that France's aircraft industry "must be supported by the government."

While Boeing fired the warning signal on Capitol Hill, Lockheed Corporation faces more immediate damage. Eastern's new A300s will replace Lockheed L1011 jetliners, which will then go on the used-plane market. But the airbus also competes with the Boeing 747 and the McDonnell-Douglas DC10. Those three companies can and do offer subsidy plums to buyers, but cannot afford the French government's juicy level.

Those A300s for Eastern are just the beginning. Similar subsidized deals with Allegheny and PSA (Pacific Southwest Airlines) are in the talking stage. What's more, airbus sales to U.S. carriers are the breakthrough for cutthroat competition against the Americans, with Japan the next target. "The Europeans are pulling out all the stops to win sales in Japan," Aerospace Daily reported last week. "Aside from normal commercial representation, the governments involved are applying strong pressure on the Japanese government."

The stakes are high. Last year's U.S. aerospace exports totaled $7.6 billion against $732 million in imports. For commercial aircraft, the export surplus was $2.5 billion in 1977 (down from $3.1 billion in 1976). Considering the record U.S. trade deficit and its ruinous effect on the dollar, that bulge in commercial aircraft is one the United States cannot afford to surrender.

Unlike textiles, electronics or even steel, this is not a case of foreign productivity and ingenuity outstripping the sluggish Yankees. The Americans can still make jetliners more efficiently than anybody else. The difference is France, Inc., aligned against three private American producers.

While the French emulate the Japanese hard-sell subsidies, U.S. policymakers are occupied in loftier pursuits. At the middle level, officials here say they want to study the Eastern transaction more closely before doing anything else. But the role of Adam Smith does not fit the hard world of neomercantilists, threatening to cloud a rare American bright spot in world economics.

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INDUSTRY September 24, 1980

SECOND INTERIM REPORT ON JAPAN'S AIRCRAFT INDUSTRY POLICY

The Aircraft Division, Aircraft & Machinery Industry Council, MITI, has published its second intermediate report on Japan's aircraft industry policy. This was the basis for MITI's FY 1981 budget request submitted in August, in which the ministry requested research funds for the Y-XX medium transport development program and financing airlines' purchase of Boeing 767s.

A translation of the intermediate report follows:

The aircraft industry must play an important role in the national economy. However, aircraft development and marketing usually involve financial risks. This risk factor forces the government to take a major part in development of the industry.

Japan's aircraft industry policy should be based on the following recommendations:

1. Aircraft Technology Research

Basic and practical research on aircraft technology promotes not only the technological level of the aircraft industry and its development but also the level of the nation's technology. The following points should constitute the base for research:

(1) Promotion of Practical Research

Japan's basic research on aircraft technology mainly at governmental institutes has made substantial progress, however, further promotion is necessary. As for practical research for application of basic technology to aircraft development, Japan is behind the United States and other developed nations. Emphasis should be put on research for practical utilization of advanced technology.

The private sector should undertake such practical research because this type leads directly to aircraft development. However, the research costs so much and is a financial risk to the private sector, because application of research to actual aircraft development is not guaranteed. Therefore, the government should take the leadership in practical research while utilizing the private sector's ability.

SJAC's establishment of an advanced aircraft technology development center in FY 1980 is a favorable move. It will be desirable to expand the center in the future.

(2) Promotion of Test and Research Equipment

To step up practical research, wind tunnels and other equipment for tests and research should be increased. Equipment needed for an immediate increase includes numerical test simulators (large computers for numerical analysis), large transonic and other wind tunnels, operation simulators, large acoustic fatigue test systems, environmental test equipment for jet engines, and large elementary test systems.

Equipment for both basic and practical research should first be increased at the Science and Technology Agency's NAL. Private firms' joint test equipment would then be considered.

2. Development and Production of Commercial Aircraft

Since development, production and marketing of commercial aircraft are the foundation of the aircraft industry, the government and industry should promote the ongoing Y-X (Boeing 767) and XJB (RJ500) Anglo/Japanese aero engine programs while proceeding positively with new programs like the Y-XX project. Future aircraft development, production and marketing should be based on the following policies:

(a) Development, Production and Marketing Risks

Aircraft development, production and marketing risks are covered by semigovernmental companies in European countries and by private companies in the United States.

In Japan, the government has founded NAMCO jointly with private firms for the YS-11 program to cover the greater part of development, production and marketing risks. In the Y-X program, government loans are being given to CTDC to cover development risks. Production and marketing risks are the responsibility to private companies.

In future aircraft development, production and marketing programs, production and marketing risks should be covered by private companies. This would utilize the energy and efficiency of the private industry which has supported Japan's postwar economic growth. However, development risks, which are extremely high, should be shared by the government and private companies. The government's extension of loans and subsidies is desirable.

As for future programs proposed by the government, all development, production and marketing risks should be covered by the government.

(b) International Collaboration

International collaboration is being increasingly adopted for aircraft development. Examples include the Japan-U.S.-Italy Y-X (Boeing 767) program and the European Airbus project. Japan also should collaborate with other nations in future major programs so as to disperse technical and marketing risks and development funds and to secure markets.

(c) Central Organizations for Aircraft Programs

Aircraft development, production and marketing should be undertaken by individual aircraft manufacturers in principle. However, it is difficult for individual firms to carry out big projects such as the Y-X and XJB programs. Intercompany collaboration is necessary for such programs. In this case, companies must set up central organizations to coordinate different plans of individual firms. In international collaboration, such organizations are necessary to unify ideas of the entire Japanese aircraft industry.

Japan has so far set up NAMCO for the YS-11 development, production and marketing, and CTDC for the Y-X (767) development as such central organizations.

NAMCO was established in 1959 under the Aircraft Industry Promotion Law to develop, produce and market Japan's first commercial transport, the YS-11. Since YS-11 production stopped in FY 1973, NAMCO has been engaged in supply and product support and other business. This support will have to be continued as YS-11s are expected to be operational over the next 15 years. However, its cumulative deficit had risen to slightly less than ¥7,000 million at the end of FY 1979. Its income cannot cover expenses at present, and therefore, its deficit will continue to increase. Measures should be taken to cope with this situation as quickly as possible.

CTDC now undertakes development of the Y-X. However, some quarters have expressed doubts about its engagement in production of the aircraft. CTDC founders will have to reconsider the organization's business after production starts.

(d) Financial Source for Loans and Subsidies

The government must secure the source for large loans and subsidies in order to promote future commercial aircraft development. The source should be the general account because promotion of commercial aircraft development usually leads ~~to technology spinoff in Japan's industry and eventually benefits everyone.~~ Some recommend special accounts be set up for such special aircraft as flyingboats and STOL planes. This opinion should be further studied as establishment of new special accounts involves several problems.

(e) Government Loans and Subsidy Extension Formula

In aircraft development programs, design and schedules are frequently changed because of technical reasons and market trends. This results in a fluctuation of the amount of development funds needed. Therefore, a formula should be adopted for appropriating government loans and subsidies flexibly in response to actual progress.

3. Commercial Aircraft Trade

It is difficult for Japan to develop aircraft only for its domestic market. To make aircraft development programs profitable, Japan has to depend on foreign markets for the majority of sales. This calls for promotion of smooth international trade in commercial aircraft. The trade should be based on following policies:

(1) Promotion of Free Trade

The commercial aircraft trade agreement has been established as part of the GATT Tokyo Round agreements for freer world trade. This envisages international aircraft sales based on the principles of free trade.

The Japanese government has neither imposed restrictions on aircraft imports for protection of the domestic industry nor intervened in introduction of foreign aircraft. In some countries, governments have concluded so-called offset contracts with foreign nations under which domestically-produced components must be used for aircraft imported from abroad. This is not the case with Japan.

Promotion of free trade principles will contribute to development of the world's commercial aircraft industry. Therefore, Japan should strive to maintain and develop a free trade setup on the basis of the GATT agreement.

(2) Dollar-based Export Financing Systems

Every country extends governmental export credits for commercial aircraft because they are frequently key terms in aircraft export deals. European nations as well as the United States have dollar-based public export financing systems since the world's aircraft trade is settled mainly in that currency. However, Japan maintains only yen-based financing systems.

In proceeding with international aircraft development programs, participating nations will furnish dollar-based export credits to aircraft purchasers according to the countries' aircraft production shares. If Japan has no dollar-based export financing systems corresponding to those of aircraft development partners, smooth aircraft marketing will be affected to the disadvantage of Japan. Therefore, Japan should set up dollar-based export financing systems to cover its share in joint aircraft production with foreign partners. If foreign countries attach special incentives to export credits, Japan should take measures that would correspond with them.

(3) Commercial Aircraft Import Financing Systems

Japanese airlines use aircraft-exporting countries' export financing systems to purchase of commercial aircraft unless the government takes special measures to promote imports. For export of aircraft developed jointly by Japan and foreign countries, however, the foreign partners are expected to let export financing systems cover only costs corresponding to their production shares. In that case, aircraft costs for the Japanese share would not be subject to the foreign partners' export financing systems. This would make Japanese airlines' purchase of jointly-developed aircraft disadvantageous to import of aircraft developed wholly by foreign countries. For Japan-participated international aircraft development programs, Japan should establish public financing systems to cover Japan's development and production share.

(4) Aircraft Industry and Defense

Every country sees the aircraft industry as an important part of its defense industry. Every government provides funds to the aircraft industry for development, production and research of military aircraft. Under these circumstances, military aircraft account for the greater part of sales of the aircraft industry. The Japanese aircraft industry's dependence on defense is especially high. In 1979, military aircraft captured as much as 86 percent of the aircraft industry's sales in Japan.

The government should further promote domestic production and research and development of Self-Defense Forces' aircraft to help upgrade the defense-oriented aircraft industry.

Although cost and performance requirements for commercial and military aircraft are different, development and production techniques are closely related. Therefore, research and development of commercial and military aircraft should be carried out in tandem.

DEFENSE

MSDF ORDERS FIVE FY 1980 FUNDED WARSHIPS

The Maritime Self-Defense Force (MSDF) awarded contracts in the middle of September for construction of five new warships under the FY 1980 defense budget, including two 2,900-ton DDs, one 1,400-ton DE, one 2,200-ton submarine, and two mine-sweepers.

The 2,900-ton DD type destroyer will be armed with up-to-date missile systems and other advanced equipment. It will be powered by the Rolls-Royce/KHI TM3B Olympus and the RM1C Tyne gasturbine engines, which KHI will produce under license. The 1,400-ton DE escort frigate will be powered by the Olympus gasturbine engine for highspeed operations and the MHI-designed 6DRV diesel engine for cruising. The first Harpoon SSM-armed submarine will be built by MHI, powered by KHI's V8V diesel engine. Japan Steel and Hitachi will each construct one mine-sweeper, both of which will be powered by MHI's 12ZC diesel engine.

BRITISH NAVAL ENGINE EQUIPMENT FOR MSDF

SSS Gears Ltd. of London will appoint Chuetsu Waukesha Co., Ltd. of Tokyo its representative in Japan for the sales and services of its synchro self-shifting (SSS) clutches to the Maritime Self-Defense Force (MSDF). A formal contract will be signed very soon, the Japanese company revealed last week.

SSS clutches are in use with leading navies of the Western world as power transmitting components of Rolls-Royce

International Affairs Department Report
International Association of Machinists
and Aerospace Workers

JAPAN'S AEROSPACE STRATEGY

Japan is currently behind the U. S. in aerospace technology, but this is no reason for complacency. In the course of their industrial development, the Japanese have demonstrated time and again their ability to borrow foreign technologies and improve on them.

The major disadvantage the Japanese face in achieving their plan to develop aerospace as one of their priority high technology industries is the absence of a large domestic market. This lack is owing principally to the constitutional prohibition, adopted after Japan's surrender at the end of World War II, on development of an offensive military capability. Japan has two commercial airlines, but these cannot compensate for the absence of a substantial military market.

As a result of these factors limiting domestic demand, Japan's aerospace development will depend heavily on exports. For this reason, Japan signed the International Agreement on Civil Aviation, which eliminates tariffs on civilian aircraft and most aircraft parts and contains provisions intended to discourage, if not prevent, governmental interference in airlines' choices of new aircraft.

The Japanese carefully research which technologies to borrow from whom. Thus, under coproduction arrangements, they are borrowing airframe manufacturing technology from Boeing (the undisputed leader in that field), engine technology from Rolls Royce, and they are working with Fokker to develop expertise in small aircraft technology.

Internationalization of the Aerospace Industry

Due to the increasing costs and complexities of the industry, many national industries are banding together to share technical expertise and financial risks. International collaborations involve all sizes of planes, from the 34 seat Fairchild-Saab (U.S.-Sweden) to the 230 seat Boeing 767 (U.S., Italy, Japan). Airbus, McDonnell Douglas and Boeing were all wooing Japan to collaborate in building a 100-150 seat aircraft before Fokker won the agreement. Several countries have also approached Japan about a joint venture in commuter aircraft.

Joint ventures compensate Japan for its competitive disadvantages by enabling expertise to develop gradually over a large number of projects, each refining the know-how on manufacturing a particular component. Joint ventures also serve to overcome marketing disadvantages by giving the Japanese the needed reputation and marketing network.

Japan and Italy are each producing about 17 percent of the Boeing 767. The Japanese government is providing half of the $140 million needed for Japan's part of the agreement. Mitsubishi Heavy Industries, Kawasaki Heavy Industries and Fuji Heavy Industries will produce fuselage sections and wing fairings for the Boeing 767.

In December 1979, Japan signed an agreement with Rolls Royce Ltd. of England to coproduce a new jet fan engine, the RJ-500. The Japanese partners are Ishikawajima-Harima Heavy Industries, Mitsubishi Heavy

Industries and Kawasaki Heavy Industries. The Japanese government will initially provide three-fourths of the Japanese share of the investment, decreasing to two-thirds and eventually to one-half over the course of the seven-year project. The companies are supposed to pay back the government subsidies after the engine is commercialized.

In November 1980, Japan signed an agreement with Fokker Aircraft to merge development of the Japanese YXX with Fokker's F-29 program. This 100-150 seat narrow-bodied jet is designed to replace the Boeing 707 and Douglas DC-8. Japan's Ministry for International Trade and Industry has forecast active demand for such a new entry after 1985. The RJ-500 engine is sized to fit the F-29 and both have scheduled delivery dates in 1986. The Japanese were also negotiating with Boeing over its participation in the project.

The Aerospace Market

The U.S. market provides about 45 percent of non-Soviet world demand for passenger aircraft and about 66 percent of non-Soviet world demand for general aviation aircraft. During the 1980s several thousand aircraft built when jet fuel cost 10-12 cents a gallon will have to be replaced, as fuel costs have increased from 12 percent of average airline operating costs to 31 percent. A major competition is underway for new fuel-efficient aircraft in the 120-150 seat category.

The U.S. fleet targeted for replacement consists of 1,609 Boeing 727s, 669 Boeing 737s, 863 DC-9s, and several hundred other aircraft.

Another major area of growth is in commuter aircraft, in which market analysts predict worldwide demand for 1,000 aircraft in the 20 to 40 seat range through 1990. Nearly half of this market will be in the United States.

This growth in U.S. demand was stimulated by the Airline Deregulation Act of 1978. The removal of government controls on fare and route structures led major airlines to withdraw from short-haul routes on which large jets were uneconomical. Commuter airlines have expanded to serve these markets. Before 1978, U.S. aircraft manufactures lacked incentive to produce commuter aircraft. Only one U.S. model is available, and all of the other commuter aircraft are manufactured in Canada and Europe.

Business jets have a strong and steady demand pattern. Japan already has a high reputation and strong foothold in this market. Mitsubishi produces the MU-2 turboprop jet in Japan and ships it to San Angelo, Texas for assembly. The plane has been a top seller for over 10 years, and the company has expanded its sales operations to France, Germany, Belgium, Switzerland and Britain.

Mitsubishi has introduced a new, more advanced executive jet model, the MU-300 Diamond 1, a twin-turbofan jet. North America is the main market target.

Japan is also entering the market for helicopters. The BK-117 is a joint venture of Kawasaki Heavy Industries and the West German company, Messerschmitt-Bolkow-Blohm. Development is occurring simultaneously in both countries and dual production lines will be established on a 50-50 basis. First deliveries are scheduled for late 1981. Helicopter demand is projected to increase at about 11 percent a year, and may prove to be the strongest growth sector in the aerospace industry.

The next logical sector for the Japanese to move into would be commuter aircraft. Although European companies are wooing Japan for a joint venture in this area, Japan has no current plans to enter the market. A future move in this field should not be precluded.

While Japan is moving up the complexity ladder in small aircraft, the industry is also developing technological expertise in the large aircraft family. The jump from small aircraft production to large aircraft is so large that it cannot be considered part of a continuum. Official Japanese policy is to pursue aircraft development along two tiers — national projects in small aircraft and international collaboration. Large aircraft development is to be sought through international projects. This helps to overcome a possible barrier to market entry, the short supply of specialized alloys, base metals and other materials used in high technology.

Military Aircraft

Japan has acquired most of its military technology through producing U.S. aircraft, missiles and other equipment on license.

During the past 15 years the two major U.S. military aircraft produced under license in Japan were the F-4 fighter and the P-2C, an antisubmarine patrol plane. Japan is now producing almost 100 percent of the F-4, and has developed technological improvements on the P-2C. In 1978, Japan signed agreements to produce under license the F-15 fighter and the P-3C. Licensed production of the F-15 is costing twice as much per plane as it would cost to buy it from the U.S. However, the licensing arrangement gives Japan the technical data packages for producing one-third of the plane, allowing Japan to make substantial progress in avionics, in which its technology lagged behind the state-of-the art.

Another project is the all-Japanese trainer plane, the MT-X.

The U.S. Department of Defense for years has been pressing the Japanese to assume a greater share of the defense burden by producing military aircraft, ignoring the spinoff effects on competition in the civil aviation industry, and Japan's potential role as a competitor in military export markets. The Electronic Industries Association of Japan has been urging the Japanese government to lift its ban on arms exports, to allow larger scale production which would lower costs per unit.

Future Developments

Japan's Ministry for International Trade and Industry (MITI) has a five year project to make Japan a major competitor in the aircraft market. In addition to international joint ventures, MITI has two high priority all-Japanese projects. These are a fanjet short takeoff and landing (STOL) aircraft, and the F-JR fanjet engine to power the STOL plane. These projects are an important part of the Japanese aircraft industry's efforts to develop independent technology and to increase its technical development capability.

Japan's ambitions in the aerospace field and the willingness of the Japanese government to subsidize research and development costs raise serious questions about U.S. technology transfers.

Summary Statement

Rebuilding America

Domestic Economic and Industrial Policy

Abandoned plants and mills, rusted rail sidetrackage, technologically outdated steel mills, rubber plants, and textile and apparel factories, ghostly electronic plants, and crumbling industrial cities are stark reminders of America's declining industrial base. Chrysler and the auto industry are just the tip of the iceberg.

Meantime, inflation and persistent high unemployment weigh heavily on the backs of working people, the jobless and the poor. Plants shutdown, move or runaway, stranding workers and entire communities in their wake. Defense contracts expire, are shifted about, contracted-out or sent overseas for off-shore procurement. Increased military spending goes to highly capital intensive firms and doesn't create enough jobs to take up the slack in the declining civilian sector.

Corporate giants, loudly proclaiming to be champions of "free" enterprise, are lined up in the Halls of Congress and at the White House door, pleading for federal assistance and bail-outs in one form of tax and regulatory concession after another. Cut taxes, deregulate, undermine wages, hours and working conditions, bust unions and get the hell out of the way is their cry.

The fashionable name for their program, which is a throwback to the 1920's just before The Crash, is "reindustrialization." It is a clever flag-word designed to arouse people and workers to a sense of urgency, with a touch of patriotism thrown-in.

There are several variations on the reindustrialization theme, but all schemes have several basic things in common. All assume that corporations do not have enough capital to invest in new plant and equipment - despite nearly three years of record smashing profits in 1977, 1978 and 1979, and in spite of investments overseas estimated to run at about $30 billion per year. All schemes assume neither government nor trade unions have any business meddling with business decisions. All schemes assume corporate management is the sole and best judge of how to run the economy. All schemes assume a competitive free market with supply and demand determining prices and resource allocation - when in fact a few giant firms control most industrial production and markets. Altogether, about 800 giant firms, many wealthier than most nations, control 70 percent of the business transactions in this country, while some 11 million firms dogfight for the remaining 30 percent of business.

The trouble with these reindustrialization schemes is it excuses corporate management from any kind of community-wide economic and social responsibility. It excuses corporate management from getting us into the mess we're in - and the deeper disaster looming on the horizon. After all, it wasn't the government or the environmentalists that gave us Love Canal, Three Mile Island, and PCB. It wasn't the government, but the major oil companies that hooked us on OPEC. It wasn't the government or the UAW, but the auto manufacturers who refused to build small and fuel-efficient cars in this country. And it is the steel companies who have chosen to diversify into chemicals and Dixie Cups, rather than reinvest profits in modern steelmaking plants and equipment.

It is corporate management buying into foreign firms and shipping production and technology overseas. It is corporate management choosing to exploit Third and Fourth World countries, while creating our own underdeveloped economy here at home. It is private U.S. banks that have overextended themselves with loans to dictatorial and right wing governments that cannot be paid back, not the Foreign Aid program.

Opportunistic and shortsighted corporate planners have led us to the brink of industrial breakdown. There is no reason to suppose that given a totally free hand in planning our economy, they will behave any better.

It is the puspose of this title of the bill to achieve domestic full employment and economic growth by (1) making corporations responsible to the communities where they do business and to the nation as a whole (2) through coordinated domestic economic planning to meet priority industrial needs in both the civilian and military sectors of the economy (3) by protecting workers and communities from arbitrary and sudden corporate decisions to shutdown, move, and introduce new technology (4) and by providing a key role for trade unions to play in determining and establishing a national industrial policy.

The main features of this bill are:

(1) Corporations doing business in interstate commerce would be federally chartered and would be required to meet certain economic and social standards written into that charter, such as the guaranteed right of trade unions to organize and bargain collectively, guaranteed human rights for workers on the job, job safety and health protections, environmental safeguards, and support of a federal investment reserve fund.

(2) Economic and production priorities would be synchronized with foreign trade, regional, state, urban and rural priorities and needs, and determined through a national investment and production agency.

(3) Corporations would be required to show cause why they must close, shutdown, move or transfer operations, and if a corporation failed to show cause, it would be permanently enjoined from doing so.

(4) Economic development programs would be tailored to meet specific instances of economic dislocation.

(5) New technology would be monitored and regulated to protect workers' privacy, ease job loss and facilitate job transition, and research and development programs would search for new products, new markets and, thus create new job opportunities.

(6) A National Employment Opportunity Service utilizing the latest and most sophisticated speed-of-light technology would be implemented with the capability to move into local plant and job sites, in order to match-up idle skills with job opportunities anywhere on the continent.

(7) A National Industrial Development Bank would fund and make loans to job creative industrial development programs on an industrial production priority basis. Initial funding for the bank would come from deregulated gas and oil windfall profits taxes, a surtax on profits of defense contractors.

(8) In cases of aggravated inflation in monopolistic markets and the basic necessities of life, targeted economic controls programs would be developed and utilized.

Under this title, state labor laws would be made uniform to conform to the highest standards, prevent corporations from exploiting differences among the states, and the Right-to-Work (for less) law would be automatically repealed.

The essence of this bill is that Corporate America would be required to sign an economic and social contract with its workers and with the communities in which it operates.

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Rebuilding America

Domestic Economic and Industrial Policy

It is the purpose of this title to promote full employment and economic growth by: (1) legally defining large corporations as entities with economic and social responsibilities to the communities in which they operate and to the nation as a whole; (2) providing for coordinated domestic economic planning; (3) protecting workers and communities against sudden plant closures, transfers and mass lay-offs.

A. Private corporations doing business in interstate commerce are deemed to be operating for the convenience and needs of the community, in the public interest for the benefit of the public and in expectation of benefit to the public, and will be federally chartered.

The Secretary of Commerce will issue federal corporate charters and establish the fees and procedures for same.

Each federal charter will include an economic and social clause that will commit the corporation to (1) guaranteed human rights in its employment policies and practices and its corporate conduct in the community (2) guarantee its employees the right to organize and bargain collectively for wages, hours, working conditions, etc. (3) protect workers and communities from environmental, health and safety hazards (4) provide one year's advance notice to the Secretary, the community and to its workers in event it finds it necessary to shutdown, close, move, transfer or otherwise curb or curtail all or part of its operations, such necessity to be proven at a public show cause hearing, if challenged by the workers and/or their bargaining agent, and/or by community petition (5) annually pay an amount equal to 1% of net sales into a federal investment reserve fund.

B. The Domestic Investment and Production Agency is created.

The Agency will have exclusive responsibility within the Executive Branch for domestic economic policy formulation and implementation. It will have the primary duty to develop an industrial policy that will achieve and sustain full employment, mitigate economic dislocation, allocate resources and facilitate the transfer of resources to designated areas of priority need and critical and emergency needs.

The Agency will have a Director, nominated and appointed by the President with the advice and consent of the Senate.

The Director will serve at the will and pleasure of the President, be granted Cabinet level status, with salary and perks commensurate.

The Agency will have the following offices, each headed by a Deputy Director, nominated and appointed by the President, with the advice and consent of the Senate:

Congressional Liaison and Interagency Cooperation
National Priorities
Foreign Trade Agency Coordinator
State, Regional and Urban Development
Rural Development and Land Use
Research, Development, New Products and Marketing
Capital Formation and Mobility

Each Deputy Director will report directly to the Director and be given status, salary and perks commensurate with the Deputy Secretary level.

1. The duties of the Congressional Liaison and Interagency Cooperation Deputy Director are apparent on their face and (s)he will (a) keep the Congress fully informed of the activities, programs,

problems, and progress of the Agency and its offices (b) keep the Director and Deputy Directors informed of Congressional actions and sentiments with respect to legislation and policy formulation (c) maintain liaison with all other departments and agencies of the federal executive (d) develop and prepare each year a legislative agenda for the President to present to Congress.

2. The Deputy Director for National Priorities will have the following duties: (a) through social cost-benefit analysis, review and evaluate all federal assistance, regulatory and tax programs affecting economic development, in order to identify overlaps and/or gaps, excessive bureaucratic costs, and tax barriers or bonanzas (b) canvass and prioritize economic and social needs in the civilian sector of the economy (c) independently review, assess, prioritize and make recommendations to reconcile the economic demands of the military sector of the economy, with the needs of the civilian sector (d) develop an economic adjustment and development plan that will (1) fulfill unmet civilian economic and social needs, (2) meet realistic requirements of the military (3) in the event of economic dislocation, whenever and for whatever reason, protect workers income, health care and housing; provide job training and continuity of employment; sustain vital community services that may be impaired and develop an economic reconstruction plan that will make impacted local economies viable and whole.

The National Priorities Deputy Director will have discretionary use of the federal investment reserve fund (A.5) for the purpose of d(3) above.

The National Priorities Deputy Director will, upon notice from the Secretary of Commerce that a federally chartered corporation's advance notification of intent to close has been challenged, by either the workers or community, appoint a five-member public commission to hold public hearings in the local community, where it will be incumbent upon the corporation to show cause why it cannot continue to operate profitably for the convenience and needs of the community.

The Commission will have subpoena powers to produce witnesses, corporate data and information.

Corporate data and information will be shared with petitioners.

Petitioners may call for expert witnesses and testimony.

If the Commission finds the corporation failed to show cause, a permanent injunction will be issued to prevent the corporate shutdown, move or transfer.

Quick-sale successors, whether intrastate or interstate or foreign, will be bound by the economic and social clause of the original federal charter.

The corporation may appeal the Commission's finding to the federal courts, and petitioners may also appeal.

If the corporation violates a permanent injunction, the National Priorities Deputy Director will recommend to the Director federal seizure and operation of the facility or business.

In cases of failing enterprises or enterprises faced with extinction, the Deputy Director will have the duty and power to recommend to the Director a plan for either (a) public ownership including, community/worker ownership, or nationalization (b) taxpayer subsidies, or their elimination, or government-private joint ventures (c) taxpayer loans or loan guarantees (d) acquisition or merger (e) consolidation (f) divestiture (g) bankruptcy (h) liquidation - all consistent with the economic and social clause.

The public hearing Commissioners will be selected from the American Arbiters Association and none may have a direct or indirect pecuniary or vested interest in the corporation.

They will be paid per diem expenses while hearing the case, plus a reasonable fee while coming to their decision, which will be written, with majority and minority opinions.

All records and transcripts of the proceedings and decision will be made public and become the property of the federal government kept in trust for the people.

Costs of the show cause hearings will be borne by the Agency.

The Deputy Director for National Priorities will recommend ways to achieve uniform federal labor laws and standards consistent with the highest denominator of the economic and social plan recommended by the Labor Industrial Sector Board of the International Trade Agency, as prescribed in the Inner Cities' development zone and as required in the federal corporate chartering procedure in A above.

Whenever inflationary prices persist for six months or more in industries characterized by monopoly or oligopoly, or by other non-competitive forces, or in industries supplying the basic necessities of life, i.e., energy and utilities, food, housing, health care and transportation, the Deputy Director for National Priorities will investigate and analyze the causes of those inflationary prices, and will develop a targeted economic controls program for such industry or industries, and recommend to the Director that the President invoke economic control powers granted by the Congress, or in the absence of Congressional sanction, recommend the President request such authority, and upon Congressional assent and Presidential directive, the Deputy will implement the program.

The Deputy will have subpoena powers for the purposes of conducting the investigation.

Any cost and price monitoring staff necessary to the investigation and analysis and/or necessary to carry-out the controls program, will include at least two trade union members recommended by the Deputy Director of the Labor Industrial Sector Board of the International Trade Agency.

To the maximum extent possible, all other staff for the Economic controls program will be recruited and borrowed from among career civil service employees already in the federal service.

Failure to cooperate in the cost and price analysis and investigation, or failure to comply with controls may lead to federal seizure of corporate assets, management and operation by the Agency, or heavy fine levied on offending corporate directors and executives , or all of the above.

3. The Foreign Trade Agency Coordinator will work closely and in consultation with the Labor Industrial Sector Board of the International Trade Agency.

The Foreign Trade Agency Coordinator will have access to and convey all studies, data and information produced by that Board, to the Domestic Investment and Production Agency, which will utilize the Board as its primary industrial sector research and fact-finding arm.

The Foreign Trade Agency Coordinator will work in consultation and harmony with all other offices of the International Trade Agency as circumstances may require and dictate.

4. The Deputy Director for State, Regional and Urban Development, will have the following duties: (a) establish and maintain liaison with all state, regional and urban industrial development and planning agencies (b) canvass and survey state, regional and urban industrial development plans, comparing incentives and differentials in taxes, wages, land and building costs, labor laws, safety and health and environmental protection laws and regulations (c) canvass and survey sector-by-sector the condition and status of state, regional and urban economies, noting strengths and weaknesses of the industrial base and forecasts for growth or decline (d) prioritize and synchronize state, regional and urban development goals (e) design industrial development programs that will match needs and resources, facilitate the mobility of resources to underdeveloped areas, and which will eliminate artificial economic and social differentials that are used inefficiently and unfairly as industrial development lures and which have socially undesirable consequences.

Each program will be consistent with the economic and social clause in A above.

The Deputy Director for State, Regional and Urban Development will work closely with the Foreign Trade Coordinator in matching resources and needs for industrial development.

5. The Deputy Director for Rural Development and Land Use will have the primary responsibility to develop a long range domestic food and fiber policy.

Duties will include: (a) canvass and survey the economic and social conditions of the rural population on the farms, in the communities, among the Native American nations and migrant labor (b) inventory rural land use and values (c) survey farm production land ownership and control, with income, size and value classifications, and historical trends and projections (d) assess and forecast food and fiber producers' resource needs, on a commodity-by-commodity basis, and compare with domestic needs for food and fiber and export potential (e) prepare and prioritize a rural community needs agenda and develop a business and industrial program, consistent with the economic and social principles in A above, with emphasis on community physical infrastructures (f) prepare and prioritize a farm-to-market production program that will meet domestic food and fiber needs forecasts and synchronize domestic policy with a realistic food and fiber export policy. Such a program may recommend restructuring of the production and distribution system in terms of efficient resource allocation, ownership and control (g) investigate, study and recommend ways to alleviate labor surplus and labor abuses in rural areas.

The Deputy Director for Land Use and Rural Development will coordinate and work in cooperation with the Chair of the Food and Fiber Production and Processing Committee of the Labor Industrial Sector Board of the International Trade Agency.

6. The Deputy Director for New Technology, Research and Development, and New Products will have the primary duty to investigate, study and recommend programs to: (a) monitor the advent and introduction of labor-saving new technology (b) move displaced labor resources upstream in the manufacture, deployment, operation and maintenance of the new technology, before it comes on line (c) train and retrain workers displaced by new technology for employment in areas and occupations where skills and workers are in short supply. In this connection, the

Deputy Director will utilize the new technology in the design of a national employment opportunity service, that will have the capability to move into a local plant and job site and match up redundant job skills with job opportunities throughout the country (d) share productivity and cost-savings with workers impacted by the deployment of new labor-saving technology (e) develop a code of conduct to protect workers' privacy in the workplace and to prevent employers from using the new technology unscrupulously (f) prevent a corporation from gaining monopoly or monopsony market power through new technology (g) seek and find new ways to absorb new technology into job creating and socially-useful production through new markets and new products (h) prepare and prioritize a list of research and development projects that would fulfill or help fulfill unmet and critical national needs, such as energy conversion to safe, renewable energy sources and systems; mass transit; rail revitalization and rehabilitation; inner city infrastructure rehab; seaport and harbor facilities; water transportation; and fuel efficient vehicles.

7. The Deputy Director for Capital Formation and Mobility will have the primary duty to establish and organize a National Industrial Development Bank. (S)he will be the Director of the Bank.

Initial funds for the Bank will come from: (a)a portion of the windfall profits tax realized through crude-oil deregulation (b)a portion of a windfall profits tax to be levied on deregulated national gas (c) a graduated progressive surtax on defense contractor and foreign military sales profits as long as profit controls are in suspension, or until the Vinson-Trammel Act is reinstated, (d) the Bank Director may establish regional, state and local banks (e) may establish industrial sector banks (f) the Bank may issue federally guaranteed bonds to raise capital (g) the Bank may sell federally guaranteed certificates of deposit, to cooperative banks and institutions, to private and public pension funds, to individuals in small and large denominations (h) the Bank may receive and keep on deposit at competitive interest bearing rates, surplus funds of state and local governments, their agencies and subdivisions (i) the Bank will lend money on approved payback schedules to private entrepreneurs, small and medium private businesses and/or corsortia thereof, federal enterprises, government-private joint ventures, consumer and producer cooperatives, community and/or worker-owned enterprises, local, state or regional industrial development agencies and projects, Native American nations, and foreign-based firms investing in the domestic economy (j) each borrower will agree to abide by an economic and social plan, to be negotiated at the time of loan, and which will at a minimum guarantee (1) job creation and/or additional employment (2) compliance with federal fair labor standards (3) human rights in employment policies and practices (4) the right of workers to organize and bargain collectively (5) job safety and health protections (6) community environmental protections (7) safeguards against mass lay-offs due to new technology, shutdowns, moves, or transfers of production (k) Bank loans will be made on the basis of meeting the priorities determined by the Labor Industrial Sector Board and Export Promotion Office of the International Trade Agency, the National Priorities Office, Land Use and Rural Develop ment Office, and State, Regional and Urban Development Office.

The exclusive power of the states to issue corporate charters to firms and business entities operating in interstate commerce is rescinded upon adoption of this Act, except that a state may require its own charter in addition to the federal charter, if the standards and requirements contained in the state charter, are equal to or exceed those contained in the economic and social clause of the federal charter.

Upon adoption of this Act, Section 14(b) of the National Labor Relations Act, as amended, is repealed.

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Rebuilding America's Foreign Trade

The critical problem in international trade today is the absence of any rules of the game, which provide American workers common ground with foreign workers, on which to compete.

The United States has always stood aloof from export promotion and systematic business-labor-government cooperation in pursuit of foreign trade, while other industrialized nations have aggressively developed their foreign trade posture through an overall policy of packaged trade and aid deals and trade promotion, with labor and trade unions playing a key policy making role.

International trade policy in the United States is almost exclusively determined by relatively few private Corporate interests, each individually seeking to maximize their position in world markets. As International Economic expert, Professor Ronald E. Müller of American University, incisively observes, U.S.-based multinational corporations continue to preach the doctrine of free trade and free markets, when the reality is that bargaining between multinational corporations and world governments has displaced classical market forces of supply and demand. The bargaining process between private corporations and world governments often make free trade and free markets a mockery and contradiction of terms.

There are no significant competitive forces in this situation. Instead of being based on classical market forces between companies or corporations exclusively, the deals now involve the heavy intervention of governments, in all but our own country, where private corporations have a free hand to determine U.S. trade policy, without considering the best interests of the nation. They can and do put their corporate interest above the national interest.

At the same time, the U.S. government trade assistance apparatus is a jury-built labyrinth of regulatory gaps and overlap, special favors and exceptions, and is scattered throughout the attics and remote recesses of a dozen departments, offices, independent agencies, and quasi-public entities.

As the U.S. industrial base declines, as our trade balance deficit mounts, as our current account balance shrinks, as our balance of payments deficit remains in the red, cries for reform are at last being heard. Piecemeal though they may be, the proposed reforms being offered at least are recognition that the United States direly needs an aggressive and coherent international trade policy.

Successful international economic reform means taking the system as it is and adapting and adjusting it to the realities. In the U.S., the reality is that international trade is a bargaining process, wrapped and sold in hundreds of commercial contracts, negotiated between private U.S. companies on one side of the table, and foreign governments or government-backed foreign-based multinational entities on the other side.

The reforms in this bill recognize those realities and capitalize on them in pursuit of an aggressive, coherent international trade posture, that will promote domestic and world economic growth rather than protectionism and stagflation.

Without growth there can be no reform; but without reform, there can be no growth.

This bill (1) puts the U.S. government's trade apparatii under one roof (2) recognizes the critical and key role of labor in trade policy formulation and successful implementation (3) provides for a comprehensive inventory of U.S. trade strengths and weaknesses (4) gives special attention to U.S. underdeveloped economies and Third and Fourth World needs (5) treats the dual nature of a U.S. economy, which is divided between a few hundred quasi-soverign Corporate entities dominating international trade at the top, and millions of intermediate and small businesses blocked-off from world trade opportunities below (6) utilizes existing contract bargaining procedures to implement reciprocal fair trade rules in promotion of peaceful, free-flowing international trade.

The resulting benefits of this program will surely outweigh it's costs, many, many times over.

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Rebuilding America Act of 1981

Worker Productive Parity

Fair and Reciprocal Trade

It is the purpose of this title to (a) make efficient and give cohesive direction and purpose to the nation's international trade policy, (b) by providing American workers with the means to achieve productive parity with foreign workers, who have advantages of national economic and social planning to promote growth and full employment in the context of free flowing world economic trade.

In order to achieve the purposes of (a) above, the International Trade Agency is created.

The Agency will have exclusive responsibility within the Executive Branch for trade policy formulation and implementation, enforcement and negotiations.

The agency will assume the international trade functions from the Departments of Commerce, Labor, State and Treasury, the United States Trade Representative, and corollary offices and independent agencies, including the U.S. Customs Service, the United States Export-Import Bank, the United States International Trade Commission, and the Economic Support Fund, Trade and Development Program, Food for Peace Program (P.L. 480), and Overseas Private Investment Corporation of the International Development Cooperation Agency.

The Agency will have a Director, nominated and appointed by the President, with the advice and consent of the Senate and concurrence by a simple majority of the members of the House of Representatives Ways and Means Committee.

The Director will serve at the will and pleasure of the President, be granted Cabinet level status, conferred Ambassadorial rank, with salary and perks commensurate.

The Agency will have the following offices, each headed by a Deputy Director, nominated and appointed by the President with the advice and consent of the Senate:

(a) Transition and Interagency Cooperation

(b) Congressional Liaison

(c) Labor Industrial Sector

(d) Export Promotion and Priorities

(e) Import Review and Policy

(f) Trade Negotiations, Agreements and Enforcement

(g) Multinational Corporation Monitor

(h) Intermediate and Small Business Assistance

(i) Third and Fourth World Aid and Trade

(j) East-West Trade

(k) Tax Policy Review and Recommendations

(l) Appeals and Grievances

Each Deputy Director will report directly to the Director, and be given status, salary and perks commensurate with the Deputy Secretary level.

A. The duties of the Deputy Director for Transition and Interagency Cooperation are apparent on their face, and the office will be abolished upon completion of these duties, when the International Trade Agency is established and functioning.

B. It will be the duty of the Deputy Director for Congressional Liaison to (1) keep the Congress fully informed of the activities, programs, problems and progress of the Agency and its offices (2) keep the Director and Deputy

Directors informed of Congressional actions and sentiments with respect to legislation and policy formulation (3) prepare and present a proposed international trade legislative agenda for the President to present to the Congress and the people each year.

C. The Deputy Director for the Labor Industrial Sector will be a bona fide trade union member, experienced in collective bargaining and trade union administration.

During interim vacancies in the Agency Director's office or during extended absences by the Director, the Deputy Director for the Labor Industrial Sector will serve as Acting Director for the International Trade Agency.

It will be the first duty of the Deputy Director for the Labor Industrial Sector to develop an economic and social clause on which to base international trade policy and programs that will (1) promote domestic full employment and economic growth (2) preserve and strengthen the nation's industrial base (3) improve productive parity and, hence, productivity (4) link and tie U.S. trade and aid to the promotion of economic and social justice for workers abroad, as well as at home, with emphasis on guaranteed democratic human and trade union rights, fair distribution of wealth and income, safeguards against environmental, health and safety hazards, the promotion of international peace and freedom from oppression and exploitation, whatever the source.

The economic and social clause principles will be incorporated into all activities and decisions made by the Agency and its offices, and will be negotiated into all private and public trade agreements in which the U.S. government or private entities are a party.

C-1. The Deputy Director for the Labor Industrial Sector will appoint a 24-member Labor Industrial Sector Board comprised of 24 trade union members, with hands-on production and collective bargaining experience.

The Board will function as an autonomous fact finding and recommending body to the Agency.

It will have subpoena powers for those purposes.

The Deputy Director for the Labor Industrial Sector will chair the Board.

Each Board member will, in turn, chair and be responsible for the activities of one of the following Industrial Sector Committees:

Aerospace
Air Transport
Alumium, Copper and Non-ferrous Mining and Manufacturing
Automotive and Automotive Supply
Building Construction Materials and Equipment
Chemical
Communications and Communications Satellite
Electrical Equipment
Electronics and Microprocessing
Energy and Fuels - Fossil
Energy Sources - Renewable
Exotic Minerals and Metals
Food and Fiber Production and Processing
Heavy and Industrial Construction Equipment
Machine and Manufacturing
Machine Tool and Tool and Die

Marine, Shipbuilding and Water Transport

Medical Equipment, Medicines and Pharmaceuticals

Oceanology

Plastics

Rail Equipment and Rail Transport

Rubber

Steel, Iron and Alloys

Advanced R & D and New Products

The Board, through each of its committees, will canvass and survey the basic and major manufacturing and industrial sectors to determine the condition and status of each and compare those findings with conditions in other industrialized and developing nations.

The Board will make short run and long run forcasts on the strengths and weaknesses of the industrial sectors, including structure of ownership and control, financial condition, market shares, trends and potential, raw material supplies and costs, state of technology and employment and earnings forecasts.

The Board will develop an agenda of national industrial priorities, consistent with the economic and social clause.

In cases of failing companies, or industries threatened with extinction, the Board will have the duty and power to recommend either (a) public ownership including community/worker ownership, or nationalization (b) taxpayer subsidies or their elimination or government-private joint ventures (c) taxpayer loans or loan guarantees (d) acquisition or merger (e) consolidation (f) divestiture (g) bankruptcy (h) liquidation - all consistent with the economic and social plan.

In the case of runaway firms or plants, transfers of capital or technology, or licensing or Co-production agreements, the Board will have the duty and power to recommend either affirmatively or negatively, in consonance with the economic and social clause objectives.

The Board, in cases of economic dislocation, including those that are a result of imports and import policy will prepare local employment, income and economic impact analyses and develop an economic reconstruction plan to (1) protect workers' income and health benefits, (2) provide job security, job training and continuity of employment and (3) to make the impacted local economy viable.

(Trade Adjustment Assistance Act may be incorporated into this plan).

The Board will monitor multinational corporate behavior with respect to human rights, labor relations and trade union rights and the other components of the economic and social clause.

The Board will cooperate with the International Trade Union Secretariats, domestic and foreign central trade union bodies and may assist in forming ad hoc international trade union councils on either company or regional bases, to fulfill its duties and obligations under this Act.

The Board will avail itself of the resources of appropriate domestic and foreign government offices and the various international economic and social agencies.

The Board will submit to the Director and make public biennial reports on its activities, findings and recommendations.

Board Committee Chairs will be considered top level federal management executives and entitled to the same salary and perks.

D. The Deputy Director for Export Promotion and Priorities will be responsible for the functions of the Commerce Department related to export promotion, the U.S. Export-Import Bank, Overseas Private Investment Corporation and those grain, food and fiber export programs now administered by the Department of Agriculture and International Development Cooperation Agency.

The first duty of the Deputy Director for Export Promotion and Priorities will be to conduct a global survey and canvass of corporate, international development and finance agency, and national strategies and tactics, with respect to U.S. economic and trade priorities in terms of (1) marketing objectives (2) price and pricing policies (3) tariffs (4) non-tariff barriers to imports (5) export promotions, incentives and subsidies (6) direct foreign investment (7) foreign domestic investment (8) industrial R & D, technology transfers, licensing and co-production agreements and introduction of new technology (9) new products and services (10) bilateral trade agreements and bilateral development assistance (11) multilateral trade agreements and development programs (12) participation in the World Bank, International Development Banks and the International Monetary Fund (13) floating exchange rates and foreign money markets and (14) tax havens.

The Deputy Director for Export Promotion and Priorities will review all U.S. government programs, regulations, trade agreements and development assistance programs affecting exports of capital, technology, goods and services to identify: (1) bureaucratic overlap (2) regulation gaps or the need for deregulation (3) hidden trade barriers (4) trade incentives and (5) failures or successes and their causes in achieving the objectives of such regulations, agreements and development assistance programs.

The Deputy Director for Export Promotion will report the findings of the global survey and the U.S. government policy review to the International Trade Agency Director and the public, along with recommendations to improve same.

Consistent with the Economic and Social clause developed by the Labor Industrial Sector Board, and in consultation with other relevant offices of the Agency, the Deputy Director for Export Promotion and Priorities will then prepare a schedule of Export Priorities, objectives and the means to achieve them.

The Deputy Director for Export Promotion and Priorities will have licensing authority for all exports of capital, technology, patents, trademarks, plant and equipment and will grant or deny the same, after taking into consideration the Economic and Social Plan and with the concurrence of the Deputy Director for the Labor Industrial Sectors.

In event of a dispute or impasse, the International Trade Agency Director will rule.

E. The Deputy Director for Import Review and Policy will absorb the functions of the U.S. International Trade Commission and the Import Administration of the U.S. Department of Commerce.

The first duty of the Deputy Director for Import Review and Policy will be to canvass and survey each U.S. Government sanctioned program, regulation, trade agreement and development assistance program affecting imports, in order to identify (1) bureaucratic overlap (2) import barriers and import incentives and their rationale (3) their impact on the economy in terms of balance of payments, industrial sector strength, strategic necessity, employment, income, economic growth and foreign relations or other objectives.

Special analysis will be given to Items 806 and 807 of the U.S. Tariff Schedules, the Mexican Industry Border Program, Foreign Trade Zones and the Generalized System of Preferences, with recommendations for review and revision by the Congress.

The Deputy Director for Import Review and Policy will conduct a special review and analysis of the General Agreement on Tariffs and Trade to discover absent signatories and their rationale; violations, compliance and/or noncompliance and the consequences thereof; the increase or decrease in voluntary restraint agreements, or orderly marketing agreements and the resulting effects; the efficiency of the dispute settlement procedures and their effectiveness; and gaps in the treaty that need to be bridged. Upon completion of the GATT Study, the Deputy Director for Import Review and Policy will report his findings to the Director and make recommendations for the improvement and revision of the same.

The Deputy Director for Import Review and Policy, in close consultation with relevant offices of the Agency, will develop a National Import Policy Review System, with specific recommendations for integrating Import policy with the Economic and Social clause.

The Deputy Director for Import Review and Policy shall have the responsibility of administering the Antidumping Act of 1921, as amended, the Countervailing Duties provisions of the Tariff Act of 1930, as amended, and Sec. 201 of the Trade Act of 1974.

For the purpose of determining whether unfair trade practices or increased imports are a substantial cause of serious injury, or the threat thereof, to a domestic industry producing an article like or directly competitive with the imported article, the Deputy Director for Import Review and Policy shall appoint a panel of seven experts, including at least one trade union representative of the workers in the domestic industry concerned, and shall provide suitable staff assistance. The panel shall report its findings within 60 calendar days to the Director of the International Trade Agency (or, in exceptionally complicated cases, within 90 calendar days). The Director shall refer the findings to the Deputy Directors for the Labor Industrial Sector, Import Review and Policy, Intermediate and Small Business Assistance, Third and Fourth World Aid and Trade and the Multinational Corporation Monitor for their recommendations as to further action. Within 30 calendar days they shall report their proposals to the Director who shall rule on the matter.

F. The Deputy Director for Trade Negotiations, Agreements and Enforcement will be responsible for the Conduct of same.

(S)he will be second only to the Director of the International Trade Agency as the nation's chief trade negotiator, and will be accorded Ambassadorial rank.

Along with the Director, the Deputy Director or their designees will head each U.S. trade negotiation team, whether those negotiations concern bilateral, or multilateral agreements, are conducted with private or public entities, are exploratory or oversight in nature.

Along with the Director, the Deputy Director will select the members of each negotiating team. Members may be chosen from the private sector or the public sector, but each negotiating team will have two trade union members recommended by the Deputy Director for the Labor Industrial Sectors.

The Deputy Director for Trade Negotiations, Agreements and Enforcement will be held accountable to the objectives and principles of the Economic and Social clause.

Persistent and/or serious breach of the clause may lead to recall, replacement, or both.

The Deputy Director will be responsible for policing and enforcement of all U.S. trade agreements and the top investigative personnel of the U.S. Customs Service will be based in and function under the direction of this office.

G. It will be the duty of the Multinational Corporation Monitor to act as the Agnecy's Ambassador-At-Large to the transnational Corporate Community, both U.S. and foreign-based, which represents a new quasi-sovereignty in the world economy and world affairs.

The Multinational Corporation Monitor's primary duties will be to (a) keep the Agency and the public informed on the activities, behavior, policies and practices of multinational corporations in the world economic and trade arena (b) make aware and press upon multinational corporations their responsibilities toward fulfilling the objectives of this Act and the Economic and Social clause, at home and abroad.

The Multinational Corporation Monitor will note the investment and marketing strategies, pricing policies and market shares of major multinational corporations in international trade.

The Monitor will analyze the control, structure, ownership, holdings and subsidaries of multinational corporations.

The Monitor will analyze intracorporate transfer pricing practices, with the aim of formulating accounting principles based on arms-length pricing.

The Monitor will propose suitable regulations and legislation to eliminate tax evasion and cross-subsidization of subsidiaries.

The Multinational Corporation Monitor will note the relationships of multinational corporations to cartels and other international business consortia.

The Monitor will note multinational corporation relationships with foreign governments, international agencies and foreign multinational entities.

In this conjunction, it will examine the activities, objectives and principles of the International Business Roundtable.

The Monitor will make recommendations to correct multinational corporate abuses of power and will recommend ways for multinational corporations, both U.S. and foreign-based operating in the U.S., to comply with the principles and goals of the goals of the Economic and Social clause.

The Monitor will submit an annual report to the Director, which will be made public.

Tha Annual Report will include the findings and recommendations of the Labor Industrial Sector's office with respect to human and trade union rights and labor relations.

The Multinational Corporation Monitor will have subpoena powers for the purposes of fulfilling these duties.

H. The Deputy Director for Intermediate and Small Business Assistance will act as the Agency's chief liaison officer with the domestic business community.

The Deputy Director will work closely with the Export-Promotion and Policy office and Import Review and Policy office in order to assist small and medium-sized businesses in maximizing their share of world trade opportunities, consistent with the Economic and Social clause.

The Deputy Director for Intermediate and Small Business will give special attention to the Research and Development, Market survey and information, credit, financial and foreign currency; patent, and trademark, and licensing and permit needs of such businesses.

Priority consideration will be given to those firms and enterprises located in the Inner City Development Zones described under Title I of this Act.

Additional priority will be given to those firms marketing new and socially useful technology, products and services.

The Deputy Director for Intermediate and Small Business, will cooperate and coordinate activities with the existing Small Business Administration, keeping intact the objectives and principles of the Economic and Social clause.

I. It will be the primary duty of the Deputy Director for Third and Fourth World (including the People's Republic of China) Aid and Trade to design and implement an economic development strategy that recognizes the existence of large and declining underdeveloped local or regional areas in the U.S. (1,092 Labor Surplus areas) and the basic human and economic needs of less developed nations.

Such a strategy will seek to develop the U.S. underdeveloped areas and declining industries, as well as foreign less developed countries by (a) making reciprocal trade, investment and aid agreements that will result in a net contribution to each country's balance of trade or current account and (b) reciprocally implement the principles and goals of the Economic and Social clause.

The strategy will focus on agricultural development and food supply potential; development, or lack thereof, of (1) roads, rail, and water transportation and facilities, (2) community water sources and systems, (3) sewage and sanitation systems, (4) energy and electric systems, (5) communications systems, (6) capital goods requirements.

The Deputy Director, after determining the potential for development of a country's infrastructure, will prepare a prospective reciprocal trade, aid and investment package to be negotiated between the U.S. and the country. The development prospectus may be regionalized. It will honor the Economic and Social clause.

If a country agrees to negotiate a development program, the matter will be turned over to the Deputy Director for Negotiations, Agreements and Enforcement for conclusion.

All U.S. private negotiations and contracts with the People's Republic of China and Third and Fourth World governments and enterprises will be made through and in consultation with the Office of the Deputy Director for Third and Fourth World Aid and Trade.

The Deputy Director for Third and Fourth World Aid and Trade will canvass and survey each of the U.S. underdeveloped areas, noting their assets and liabilities, in terms of human and natural resources, marketing, production and transportation characteristics.

The Deputy Director will actively recruit foreign direct investment in U.S. underdeveloped areas and prepare investment prospectuses for this purpose. Each prospectus will honor the Economic and Social clause.

All private and state and local government negotiations with foreign governments and enterprises will be conducted with the approval of the

Deputy Director for Third and Fourth World Aid and Trade and agreements or contracts resulting therefrom will conform to the Economic and Social clause.

J. The Deputy Director for East-West Trade will be responsible for developing and regulating exports to non-market economy countries with the exception of the People's Republic of China.

The Deputy Director will be the point of first contact for all U.S. private and governmental interests in East-West Trade relations.

The Deputy Director will be the conduit through which Soviet and Eastern trade initiatives will flow.

The Deputy Director will analyze all trade and aid proposals in light of the objectives and purposes of this Act.

The Deputy Director will review and make recommendations with respect to most-favored nation status of non-market economy countries.

The Deputy Director will promote the Economic and Social clause in East-West trade relations.

The Deputy Director will annually canvass and survey sector-by-sector the condition and state of the non-market economies and report same to the Director.

The canvass and survey will note and analyze trade and aid strategies, policies, and programs with respect to other countries and multinational corporations.

The report will be made available to the public in a timely manner.

The Deputy Director will assess the state of technology, industrial R & D, and the introduction of new technology in the Soviet and Eastern economies and report same to the Director.

The Deputy Director will enforce the Export Administration Act with respect to non-market economy countries.

The Deputy Director will be an advisor to all trade and aid negotiations with the non-market economy countries.

K. The Deputy Director for Tax Policy Review and Recommendations will analyze and assess the impact of current tax laws, regulations, exemptions and special tax treatments on U.S. trade, and current account balances.

A sector-by-sector approach, with firm and product specifics, will be taken. Focus will be on Deferred Taxes on Foreign Income, Tax havens, intracorporate transfer pricing and transactions to avoid taxation, and identification of tax barriers and tax incentives to exports and imports.

The Deputy Director for Tax Policy Review and Recommendations will survey foreign tax policies and practices with respect to their international trade posture.

Focus will be on tax lures and incentives that attract foreign investment, particularly U.S. investment. Special attention will be paid to foreign trade-related investment performance requirements (local content requirements and export quotas).

Upon completion of the domestic and foreign tax impact studies, the Deputy Director will make recommendations for U.S. tax revisions that will enhance the objectives of this Act, and other proposals for dealing with trade-distorting investment performance requirements.

The Deputy Director will prepare a proposal for international Conferences on Uniform Tax Policies and Fair Trade.

One Conference would focus on the industrialized nations.

A second conference would focus on the Third and Fourth Worlds.

The purpose of the Conferences would be to (a) identify and ultimately eliminate unfair tax advantages and incentives in international trade (b) promote the concept of progressive taxation based on ability to pay among all nations.

L. The Deputy Director for Appeals and Grievances will chair a 5-member Board of Appeals and Grievances to hear complaints, filed by U.S. private interests and individuals, U.S.-based multinationsl corporations, U.S. trade unions, and foreign governments and foreign-based multinational corporations, against agency rulings and decisions in an effort to resolve conflicts and disputes before they are taken to the Courts, presented for international arbitration and settlement, or become irreconcilable.

The members of the Board of Appeals and Grievances will be appointed by the Director of the Agency. At least two members of the Board will be trade union members.

The Board will hear and rule on Trade Adjustment Assistance appeals.

An Economic and Social clause would contain the following reciprocal agreements:

1. A commitment to economic planning for Full Employment and real economic growth.
2. A commitment to develop domestic markets.
3. A commitment to real per capita income gains for workers.
4. A commitment to redistribution of and social control over, concentrated land and wealth.
5. A commitment to annually devote a portion of the nation's wealth and income to a civilian Economic Development fund to be used indigenously for job creation and worker training.
6. A commitment to eradicate starvation, malnutrition, hunger, disease, illiteracy, ethnic, racial, religious and sex discrimination, and child forced prison and slave labor.
7. A commitment to water and air pollution control and environmental protection standards.
8. A commitment to develop safe, renewable, non-nuclear low cost energy systems and a commitment to nuclear nonproliferation.
9. A commitment to access to media by the public, trade unions and democratic opposition political parties.
10. The absolute right of freedom of association for workers; the guaranteed right of workers to organize and form free and independent trade unions for purposes of collective bargaining with employers - private, government or any combination thereof - over the terms of their wages and compensation, hours, safety

and health and other working conditions; the inviolable right to use the strike as an economic weapon in the collective bargaining process.

11. The right of workers and their trade union representatives to help formulate, promulgate, implement and police the economic and social plan in their respective places of work, firms, industries and at all government levels.

12. The right of workers and their trade union representatives to have access to enterprise and government data and information relevant to costs, pricing policies, including the right of workers and trade unions to participate in planning and decisions for expansions, transfers, nationalizations, redundancies, and the introduction and deployment of new and labor saving technology.

13. The right of workers and trade unions to participate in the political processes, form political parties and/or make political alliances and coalitions and the right of trade unionists to seek public office.

14. Multinational Enterprises will be bound by the ILO and United Nations Codes of Conduct. Breaches thereof will be referred to the World Court for adjudication and remedy.

15. Where national laws are non-existent or weak, International Labor Organization minimum standards on wages, hours, safety and health and other working conditions and freedom of association will prevail and be strictly enforced by the parties to the agreement.

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16. Where an international aid, trade, or investment agreement involves military goods and services, a 10% surtax will be levied on the vendor's after-tax profits and paid into the United Nations Peace Keeping Mission.

Current Session Foreign Trade Issues:

1. Trade Adjustment Assistance Act coverage will be expanded to cover employees impacted by imports at the secondary and tertiary levels.

   Employees of independent auto dealers will be covered. Health insurance coverage will be provided to TAA recipients. The Job Training provisions of the TAA will be doubled in size and scope and full relocation expenses will be paid for job placement in other communities.

2. Oversight hearings will be held on the Multilateral Trade Agreements with emphasis on compliance or non-compliance by trading partners.

3. Hearings will be held on the existence of non-tariff barriers to trade - what forms they take, what impact they have on U.S. exports and employment.

4. The Generalized System of Preferences should be reformed to include sectoral graduation of newly industrialized countries, and to deny benefits to countries that cause serious prejudice to U.S. trade and employment.

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Ms. LEHMAN. Thank you. I am Pat Lehman, a staff member of District Lodge No. 70 of the International Association of Machinists & Aerospace Workers. Included in our membership are the majority of the workers who build, service, and maintain the major portion of all the airframe and aerospace products, both military and commercial, produced in the United States. Indeed, we take great pride in the fact that our members have had a significant role in developing and maintaining the acknowledged world leadership position currently enjoyed by the U.S. airframe and aerospace producers, a leadership position, I might add, that we are determined to not only maintain, but to expand.

At this time, Mr. Chairman, I would ask permission for a report entitled "The European Aerospace Industry and Its Future" by Felice Calissano, of the SORIS Co., Ltd., to be included in the record as part of my statement. I wish to include this report because I feel that we must understand where we have been in order to understand where we are today and to make logical plans for the future.

This report covering the years 1960–67 contains several facts with regard to U.S. expenditures on research and development in the aerospace industry, the relative costs of labor in the airframe/aerospace industry in various countries, as well as some important observations acknowledging the higher rate of production and lower cost of U.S. products in relation to European products at that time.

In addition, this report contains some important projections of the airframe/aerospace markets for the years 1968–79, as well as recommendations for the European aerospace industry.

Today, we in the International Association of Machinists and Aerospace Workers know, through our contacts with the industry, that we currently face many interrelated problems.

We do not believe our Government nor the general public truly understands the contribution to our Nation's economy both domestic and in regard to balance of trade, that is made by the products and services of the airframe/aerospace industry as a whole and the general aviation industry in particular.

The popular misconception that these products and services are used mainly for recreational purposes is damaging because it then allows proposed unfair fuel taxes, user fees, and cuts in the Export-Import Bank funding to be politically popular. While recreational flying is indeed part of the use of the products, and I might add that this does create a demand for product and services and thus jobs. For the main part these products and services provide a vital part of our Nation's transportation system, and in the conducting of our Nation's business.

The western Kansas farmer who can quickly and efficiently inspect the progress of his crops from the air, the injured child who is airlifted to the needed medical facilities in Alaska, the small insurance firm needing to quickly assess a damage claim 300 miles away, the Bank checks that need to be delivered during the night from small towns U.S.A. to a metropolitan area; these many and diverse needs are met with our products and services.

And, we in the I.A.M. & A.W. have so often, through several administrations, stood firmly for the needed funding for the

Import-Export Bank that I sometimes feel we would save a great deal of time and effort if we simply prepared an educational fact sheet for each incoming Director of the Office of Management and Budget, detailing the positive contribution to the U.S. balance of trade by the export of our products and how the Eximbank is used. I am tired of writing you all letters.

In addition, we are today faced with the weakening of the market for our product as a whole, and particularly the small singe-engine plane, both in the United States and in some foreign countries; this weakening being brought about for several reasons: First, high interest rates. Although some companies have been able to offer a lower interest rate through their own financing, this cannot continue indefinitely; second, the instance by the current administration to dramatically increase fuel taxes; third, reduction in airport aid and upgrading of facilities even though a healthy $5 billion plus fund exists for that purpose; fourth, the closing of certain foreign markets by the erection of unfair trade barriers. And I would add, fifth, the closing of certain of the control towers by the FAA. Also, other countries, notably France, provides government funds to enable French airframe/aerospace producers to compete in the world market. Mr. Chairman, I would at this time ask permission to introduce as part of my testimony, a column by Rowland Evans and Robert Novak entitled "Vying With 'France, Inc.,'" which details many of the problems caused by the French subsidy system. Furthermore, while we in the United States do not even have a national policy with regard to the areas of research and development and international trade, the Japanese currently have a 5-year program in place and operating in just these areas. I do not believe that you have missed some of these reports in time past, but I do not make the assumption that simply because I have something, everybody else has it. I would also at this time like to include as part of my testimony, a report entitled "Industry-Second Interim Report on Japan's Aircraft and Industry Policy," dated September 24, 1980. This is a translation of the report published in the JPE Aviation Report-Weekly. It details clearly the Japanese Government's role in research and development, and other useful information pertaining to the marketing and financing.

> The government must secure the source in order to promote commercial aircraft development. The source should be the general account because promotion of commercial aircraft development usually leads to technology spin-off of Japan's industry.

I find it interesting Japan recognizes that and we do not. In addition I would ask permission to introduce a report prepared by my own international affairs department of our headquarters in Washington entitled "Japan's Aerospace Strategy" which we believe gives a concise, overall view of current plans of the Japanese Aerospace Industry to; One, again steal, however legally U.S. taxpayer paid-for technology and; two, capture a sizable portion of the airframe/aerospace market we now enjoy by using the best of our technology and that of other countries to develop products to complete, financing the development and marketing with Government subsidies, and raising unfair trade barriers to U.S. products.

A further problem is the fact that much of the advancements made in U.S. civilian airframe/aerospace technology has resulted as a spinoff from research done by NASA for military work such research having been easily adopted for so-called civilian products. I might add that we in our organization feel perhaps the Heritage Foundation should stop worrying about the past and begin to look at the future. Recognizing as we do, all these problems, the lack of recognition of the contributions to our economy made by the products and services produced and offered by our members, the weakening of the market, the support of other country's government of their airframe/aerospace industry, the unfair trade barriers being raised by one country after another, the giving away of our technology and our jobs, the lack of basic and necessary research and development in the airframe and aerospace field, and the absence of even a basic U.S. policy in regard to the future development and growth of this industry, we think it long overdue that our Government and industry leaders recognize and acknowledge some additional facts and problems, for as Chairman Lee Iacocca of the Chrysler Corp., candidly stated to the Congress over a year ago, quote "laissez-faire free enterprise died a while back." Indeed, at this time, our Federal Government alone is backing various corporate enterprises in excess of $400 billion, not including the direct dependency of many corporate entities on military appropriations and the military budget. It is necessary to recognize that the fact that the world of Adam Smith does not exist any longer and no amount of wishful, backward gazing can in reality turn back the hands of time.

Indeed, all other economically advanced and industrialized, as well as developing nations, except perhaps the United Kingdom under its present disastrous administration, have learned that arguing and debating the distinction between private and public enterprise is intellectually shallow, nongermane to the task and unproductive in achieving objectives. It is obvious, as we stand in reality's starkness, that in laying the basis for U.S. policy with regard to airframe/aerospace research, development, and trade policy, and all industrial and trade policies that we must focus on an optional combination of Government and private enterprise, with a healthy and key role for worker-taxpayers and local communities to play in the decisionmaking processes of policy formulation and implementation, at both the national and local levels.

For too long, we the American worker-taxpayer have sat quietly by while our tax dollars have been used to support needed research and development, only to have the results of that taxpayer supported R. & D. given away by license, along with our jobs, to other countries. For too long, we the American worker-taxpayers particularly in the airframe/aerospace industry, have sat quietly by while products were dumped illegally onto our markets, destroying one U.S.-based industry after another along with our jobs and our lives, under the guise of "free trade" which does not any longer exist.

For too long, we the American worker-taxpayer, particularly in the airframe/aerospace industry have suffered the ravages of roller coaster unemployment. We in this organization, Mr. Chairman, are realists. We recognize that our tax money will continue to be used to support research and development, to support so-called private enterprise through loans and grants, just as it is now and we also recognize that we are today faced with unfair trade policies that rob us of our jobs, and that these unfair trade policies will continue to worsen. Therefore, at this time, Mr. Chairman, I ask permission to include as part of my testimony, some plans we have formulated that would allow the United States to make the maximum use of Government, business, and labor in working toward an equitable solution of these problems. These plans include a summary statement entitled "Rebuilding America, Domestic, Economic, and Industrial Policy," the policy itself entitled, "Rebuilding America, Domestic, and Industrial Policy," a summary statement entitled "Rebuilding America's Foreign Trade," our plan entitled "Rebuilding America Act of 1981," "Worker Productive Parity, Fair, and Reciprocal Trade."

We feel that these plans do offer solutions to many of the problems we now face in the airframe/aerospace industry, and appreciate your consideration of them.

In closing, Mr. Chairman, I would add that we in the I.A.M. & A.W. appreciate the opportunity that you have given to us today to express some of our views. The fact that you are here is an indication to us that our elected representatives recognize our lack of a national policy in the areas of research, development and international trade for the airframe/aerospace is a failure by the United States—a failure that must be corrected.

We share the airframe/aerospace industry concerns, for those concerns relate directly to jobs for American workers, both in the Nation and particularly in the State of Kansas, especially in Wichita. We are proud to be the air capital of the world. We are not willing to allow that proud title to be transferred to a foreign city because of unfair trade, unfair taxation, unfair high interest rates, unfair cuts in needed basic research and development and unfair transfer of our technology and jobs.

We in this organization take enormous pride in the products and services produced by our members in the airframe/aerospace industry. We are proud of our record of efficient productivity and of the skills and crafts of our members. We have every desire to continue to see the airways of the world and the outer reaches of space filled with products carrying the honored stamp of "Made in the U.S.A., made by the proud members of the International Association of Machinists & Aerospace Workers."

Thank you.

Senator **Kassebaum**. Thank you. Certainly, I think we have heard each of the panelists present, in many ways, similar comments on the problems facing the general aviation industry. I would like to say I do not think we are a crippled giant in the United States. I tend to think we have lost some of our yankee ingenuity. But perhaps this hearing today is an example of how we can restore that. I tend to believe, as was expressed by Mrs. Lehman, that a plan for showing how business, labor and government can work together is a beginning, because this is the only way, it seems to me, that we can restore the initiative and the vitality before we have lost the cutting edge. It is easy, as I pointed out in my opening statement, to think of the automobile industry which coasted on its laurels far too long. And to point fingers of blame against our foreign competitors is I think a mistake. We have to lock to our own house in getting things in order. I think a beginning is a strategic plan, as mentioned by Dr. Mark, that would combine the interest of all three segments, labor, management and government, that vitally effect the aviation industry. There has been talk here of quid pro quo. As a member of the Foreign Relations Committee, I know how easy it is to express this opinion. But it is sometimes far more difficult to extract a quid pro quo. It requires a sense of very delicate diplomacy which I think we are beginning to see. But I would like to point to a specific case—selling general aviation aircraft to Brazil. I think we are all familiar with that particular problem. In turn, Brazil is saying to us—because they are not wanting us to sell in Brazil while they sell here, and as you mentioned, Mr. Lair, no reciprocal agreement, no certification—all right, we will buy Airbus. And we will not buy Boeing or Lockheed or Douglas. I would like to ask you how, when in many cases we are faced with this problem with the sales of commercial aviation far exceeding even the potential in general aviation, we thread this needle?

Mr. LAIR. Well, I am certainly not going to speak for Boeing. They can speak for themselves.

Senator KASSEBAUM. No; but you can see the delicate problems that we have.

Mr. LAIR. I understand what you are saying. I think they did go ahead and buy some Airbuses in spite of the best efforts, and the so-called trade agreement. It is a difficult situation, although I am not sure that the Boeing and the others are totally unsympathetic to the position of general aviation. I think they are in favor of our free trading in those areas, too. I can't speak for them. I know how I feel about our business. It has gone on for almost seven years now. I think the agonizing part of it to me is that Brazil traded 25,000 30,000 jobs in Brazil supported by the general aviation industry, that was in pretty good shape at that time, for 300 or 400 hundred factory jobs which have been attriting almost since the day they put the jobs on. It seems that is a poor trade.

Senator KASSEBAUM. Do you feel if we did adopt policy, if there was no reciprocal agreement, there would be no certification, that this would be effective?

Mr. LAIR. Why would Brazil object to a reciprocal agreement?

Senator KASSEBAUM. As you know, they are wanting to increase their market and build up a market that they in fact subsidize.

Mr. LAIR. I am talking about reciprocal licensing agreements. I see absolutely no reason why they would object to it, nor do I see any reason why it would affect Boeing's position. I certainly do not think we ought to be certifying their airplanes if we have no certification of our airplanes in Brazil.

Senator KASSEBAUM. Let me say I do not mean to imply that I am not agreeing with you. But I think it is important to analyze some of the difficulties inherent in the situation. As I say, it is far easier to think that it can be accomplished than actually winding our way through the thickets.

Mr. LAIR. That is the reason we have such excellent Representatives in the Congress.

Senator KASSEBAUM. Thank you.

Mr. NEUBURGER. Could I comment on this perhaps? I think in the long debate with the Brazilians, that in throwing statistics at each other and getting involved in details which I believe are not quite relevant, the point has been lost. The Brazilians by their actions have violated a principle of fair trade. They have restricted competitive selling in their market. This is the point which is more important than the actual balance of trade. Secondly, I think that the Brazilians themselves have not understood yet that they are the victims. Because of their own restrictions the market has not grown; it has shrunk. This is the lesson that we have learned in the United States for 30 years, or 40 years, or 50 years. Sometimes painfully, because we have lived with competition constantly. We have often felt we wish it would go away. But if it had gone away, and if there were no competition, the general aviation market in the United States would be no more developed than it was 30 years ago, at least in terms of products that were developed for it. We would have, if we had monopoly on the market, no incentive to develop new products. The Brazilians, I mean this sincerely, are the victims of their own restrictions because the Brazilian market has shrunk in the last 7 years.

Senator KASSEBAUM. Then it is a case of their Governnment having subsidized fully their own industry which is now running at a great loss.

Mr. NEUBURGER. The Brazilian consumer is not stepping forward with the same enthusiasm to buy airplanes that he did 7 years ago. I think these are facts that transcend this petty climate of negotiation that we have had with the Brazilians for so long. I think we ought to bring this to their attention. But we do not get their attention if we do not at least show that we could enforce a quid pro quo if they do not finally see the light.

Senator KASSEBAUM. Speaking of certification, I would like to follow on with that a minute. Is there any indication that any of you might have that we might be certifying airworthiness under different standards for foreign aircraft than the standards that we have set for planes manufactured here?

Mr. LAIR. I didn't mean to imply, even, that we were lowering our FAA standards for aircraft for international certification. But the reciprocal agreements on certification really does not mean very much under their present construction. We certify an airplane over here, we take it to England. We have to go through the whole process again at enormous expense because they charge us for everything, including their trips overseas, everything. You are talking about hundreds of thousands of dollars to certify a major airplane, and major modifications of the airplane in order to fit the special requirements of the English. The reciprocal agreement means absolutely nothing, nothing at all.

Mr. COMBS. If they want to certify a British airplane in the United States we accommodate them by sending our people there at our expense. So it is a heads we lose tails they win situation. When you complain about it they tell you that it is because they are smarter businessmen. You can't deny that. We are talking about their Government being smarter businessmen, not the industry.

Senator KASSEBAUM. I have some further questions, but why don't you go ahead, Dan.

Mr. GLICKMAN. OK. We will share back and forth. You know one thing that strikes me is that general aviation has not been aggressive enough in pressing its message in Congress. As you know, we have got a lot of caucuses in the House. You have all heard of these caucuses where people get together on special interest. In the House we have mushroom, steel, alcohol fuel, textiles, automobile, shipping, arts, tourism, rural, renewable fuels caucuses. Every distressed industry in Washington has gone to the Hill and said, "We want a special caucus to represent us." Then they organize, get a lot of Members interested and then squeak a little bit and maybe get the Department of Commerce and Department of State a little more interested. What you do not see in this group for the most part are what you call historically healthy industries that haven't squeaked, and therefore may not be getting the message to Government. Perhaps it is time to form a congressional aviation caucus. Dr. Piper who is here from the U.S. Trade Representative's office indicated to me that out of the hundreds and hundreds of people in the Department of Commerce who are there promoting independent industries like textiles and steel, there was just one person whose direct responsibility is to promote aviation products throughout the rest of the world. I am not sure what role there is for the Federal Government to pursue, but it does seem that perhaps it is time to maybe take a more aggressive posture. One of the reasons why we haven't had more aggressive posture on reciprocal trade or some of these other trade issues is perhaps because the wheels haven't been squeaky enough. It is just a point that I would make.

Mr. STIMPSON. One of our colleagues did suggest a general aviation caucus last year, Jim Lloyd. Of course he is no longer in Congress. But maybe this is a time to reconsider.

Mr. LAIR. If the formation of a caucus indicates that we need protection in order to compete on the world market, I don't know whether I want to do that or not.

Mr. GLICKMAN. I would like to ask another question. At least four individuals with the companies and the Association have indicated support for the President's economic program generally. But I see the deficit picture to be very, very troublesome in the next few years. I want to know how we should treat the NASA budget in connection with what I see to be continuous efforts to cut the budget deficit? Perhaps Pat would like to respond to that too. That is, I see the pressure on cuts are going to be even worse than they were this year. I hope myself it is made across the board. I think the President is going to have to make some concessions on the defense side of the picture too. My only point is that I see the Japanese and German budgets going up in their NASA type agencies, and we have been going down year after year after year. Most of you think NASA ought to be restricted primarily to basic research. I see it even being cut more. What I would like to know is what do you think about that generally? In the total NASA budget, most of the money goes into space, not aeronautics. Do you think there ought to be some shift in those priorities?

Mr. COMBS. I know how we feel. That is that a tight fiscal policy and strong attempt to get back on a sound basis by reducing expenditures is certainly something that we can subscribe to. We are not suggesting an increase in the budget for NASA. We are suggesting a reallocation of the funds that are available to us. And always a little more emphasis on aeronautics and particularly on our particular branch of aeronautics.

Mr. NEUBURGER. I think of course everybody would like to get his own program considered in the budget. But I would like to remind you that, because you said most of it goes into space, you being the author of the Methane Act, much of that, what goes into space, has a very good fallout benefit in other areas of the economy like alcohol fuel. It is not good to have reallocation of funds without very thorough preparation, but I think it would be wonderful if there were more money available for NASA, yes. But I don't feel, for instance, qualified to say that the priorities should be rearranged, especially because so much of this high technology research in NASA does have application to medical and many other pursuits that benefit other sectors of the nation.

Mr. GLICKMAN. I suppose my point is that everybody here indicated their strong support for a government research program. I am just saying that I see the handwriting on the wall regarding what is going to be happening during the next couple of years. I fear that the NASA program will be jeopardized. Pat?

Ms. LEHMAN. I was going to wait until the other gentlemen from the industry responded but I would like to respond.

Mr. GLICKMAN. Go ahead.

Ms. LEHMAN. We in our organization have always supported NASA research and we continue to do so. I tend to believe we could probably balance the budget this year if we all went back to driving horses and rode in wagons and so forth and so on. I am just not sure, if given that choice, it would be our priority to balance the budget. I think there are times when you have to set priorities. I do not think our priorities will change dramatically except, as I said, under circumstances similar to the thunderclap such as the first sputnik, April 12, 1961, when we suddenly woke up and realized as a Nation that we were terribly behind. We had been living under a fairly conservative administration for about 8 years preceding that, or thereabouts. But we suddenly woke up in this Nation. I don't believe we are going to get hit with that kind of a bolt from the blue again. I hope I am correct in making that assumption. Rather, if we sit and suffer from benign neglect in research and development, that we are going to see a gradual erosion. I think that erosion is already taking place to some extent. I think that erosion is being helped along by floods of water from other countries, if you will. I strongly feel, strongly, that it is a gross waste of NASA and the facilities that already exist, the physical facilities that already exist. Vine covered cottages are fine but I do not think vine covered research facilities are in our best interests. I think it is a gross waste of those facilities that already exist not to maximize the use and potential there. We well recognize we are talking about tax dollars when we are talking about NASA research. We do have an overriding concern, and I think Mr. Neuburger eloquently stated that when we are financing these kinds of research and development, let us not be as foolhardy as we have been in the past and are continuing at this time to be. And that is to simply give away that technology. I do not find, for instance, that our defense posture is helped a great deal when we say to a country such as Japan, you are going to have to start carrying more of the burden of the cost of your defense. And so we do that, we do not say to them, you know, some dollars coming this way would be nice. No, no. We give them the very best of airframe technology, license to build a portion of the Boeing 767, and our jobs right along with it. Now look, folks. I am not an economist. But even a toolmaker knows that that is poor trade. And that is the kind of thing that we are continuing to see. So, yes, we as an organization feel that it is vital and in the best interest of our Nation, of our economy, not only for defense purposes but for continuing expansion that we need and must have in this industry that we are so vitally concerned with, but we are not willing to continue to give away that technology.

Mr. GLICKMAN. Let me just ask two additional questions. I would ask Mike and Bob, and Ed to the extent that he would care to amplify, why the delay in entering the commuter market on the part of domestic U.S. general aviation industry, and what do you see in the next 10 or 15 years in terms of the commuter market?

Mr. LAIR. Let me respond. I am sure you may even have a different response. We have two airplanes involved in the commuter market, both of them small airplanes, the 402 and Titan. We have a very successful international market because of the number of passengers that they can carry. And somewhat successful in the United States.

The commuter industry is in some disarray at the present time for a number of reasons, both economic and regulatory, and due to a number of other things. I am sure you are going to hear testimony on that later. The formation of new commuters primarily for economic reasons, in our opinion, has slowed down a great deal. We are not sure what the commuter industry requires in the way of configuration of an airplane. If we were sure it would probably be on the drawing boards. There are other people who have more confidence in the fact that they have the answer to the commuter industry's configuration. We are not quite that confident. If and when the commuter industry shakes out in a more stable form, and a configuration of the airplane shakes out, you can be assured that we will have an airplane competing in the market. Until that time we are going to watch and see how other developments come along. It isn't technology that is keeping us from coming up with a commuter airplane. I think when their need is defined the ideal airplane to meet that need will sell in large enough quantities to justify the investment. It is a business decision we have to make.

Mr. NEUBURGER. I would like to inject a slightly different thought in this. Historically, the commuter industry as a commuter industry began something like 10, 12 years ago, at a time when we first brought out the Beech 17 passenger Model 99. We developed an airplane with technology of the day at a time when there actually was hardly any foreign competitor. However, the commuter industry itself in the United States was so unstable that the bottom fell out of the market because the commuter operators, a shakeout of commuter operators was so great that it didn't justify continuing a manufacturing program for what was left of the industry. Then some things happened in the intervening years. The commuter industry became sort of revived as a result of very divergent needs in the economy and the transportation system. And we responded to it and developed new aircraft. But in the meantime, foreign aircraft came in, it was not really developed as commuter airplanes. Some of it might be sort of pseudocommuter aircraft, let's say like the Twin Otter, for example, came in as an STOL airplane. It served a need, but it was readily available and adaptable. Of course, new aircraft were also developed. The Brazilians came in also with an adapted airplane, really, rather than an airplane specifically developed for that market. The Spaniards' airplane, the Israeli's airplane, both of which came out of an assault, transport, a little mini C-130. That sort of thing. And there was an airplane in Northern Ireland which has been sort of on the fringes of it. But as the market became receptive in the United States in response to encouragement by the Government, like loan guarantees, like new certification requirements that had been developed, and operating requirements by the FAA. So this is how the market was revived. I think once our own airplanes that we developed for this market, we are now putting one in production, is in production now, and another is coming in 2 years, 19-passenger capacity, I think they will be very, very competitive to whatever has come in and is coming in from the outside. But in the meantime the operator is being deluged with very favorable offers of financing, for example, with which we cannot compete, with encouragements that are the result of nonadherence to the civil aircraft agreement under MTM and other privileges by which they can come in and have advantages in the U.S. markets. So this is the situation.

Mr. GLICKMAN. The only thing that disturbs me a little bit is that I am hearing from you all that you are not going to anticipate the market. You are going to wait and see how things sift down, so to speak.

Mr. NEUBURGER. Oh, no, the market is there.

Mr. GLICKMAN. The market?

Mr. NEUBURGER. The market is there. The only thing is, we are not now competing equitably in that market with those that are coming in.

Mr. STIMPSON. I think on the overall view, Congressman Glickman, it has been individual judgments on the part of particular companies. You have heard Mr. Neuburger talk on what Beech is doing, and from Mr. Lair on what Cessna is doing. Fairchild is active in the commuter market with a 19 passenger airplane and, of course, reached an agreement with Saab about producing a 30 passenger plane. Piper recently announced a very aggresive new program in the commuter market with a smaller airplane. There has been a lot of evaluation of the marketplace—and it's still going on—and different judgments as to what is the best airplane for the market. It is true the United States does not have a 30 passenger airplane manufactured in the United States today. But it is coming.

Mr. GLICKMAN. I just have one final question. Regardless of the relative merits of the air traffic controller's strike, there has been some talk about widespread tower closings and what the effect of that might be on general aviation. What do you expect the short-term effect, in the next 12 to 24 months, on your sales as a result of the air traffic control situation? Can you give any definite thoughts on that?

Mr. NEUBURGER. I would say if people are not scared away, it would not have very much effect. I think we are able—traffic is pretty normal. As Ed said in his opening statement he took a trip recently in a Bonanza, 45 hours. By simply adhering to certain guidelines like staying out of the hub areas and adjusting hours of the day, and going VFR wherever that is practical I think will be all right.

Mr. GLICKMAN. You don't see this having an effect on sales in the major hub markets?

Mr. STIMPSON. The towers have not been the basic problem. The problem has been in centers. If we are able to get all situations under flow control worked out with the FAA, capacity should be increasing in the months ahead instead of decreasing. If we are treated fairly in the major centers and are able to adopt these other procedures we talked about earlier, I do not see a major impact on sales.

Mr. NEUBURGER. I want to put that one plug for Hutchinson in once more because it is a very, very important reliever, because this is where we all test our, run our test flights.

Senator KASSEBAUM. If I may follow on with that a bit, I think it is important to remember that regarding the towers—and certainly Hutchinson is important to us in this community and area—that the private sector or local government can pick up the cost of operating these facilities. It has been proven much less costly and more efficient than the FAA. We must not lose sight of that factor, the importance of it and encourage it. We should consider this when it is necessary.

Mr. LAIR. I do not get overly concerned about the effect of the towers closures. I recognize the special case you are talking about here with Hutchinson. But I do not think the tower closures being discussed will have a major effect. Being realistic, the controller's strike and rebuilding of the system is going to have to have some effect on our business. I do not know where it is that much or that much, [indicating]. But it has to have some effect because some people are going to raise questions about it. I am not alarmed. I will certainly trade the controller's strike for a 10 percent interest rate again any day of the week as far as improving business is concerned. But it is going to have some effect. It is going to have a dampening effect on the business, some lowering which I think is impossible to measure. I think it is a combination of things we are in now which makes our lives so difficult. We could certainly live with the controller strike by itself. We might even be able to live with the interest rate by itself. But where a number of things now are beginning to affect our industry of course continue to concern us, then you are seeing the results. We laid off 6,000 people between last year and this year. I hope we do not have to lay off any more. We are certainly fighting to avoid doing that. But we have to match our production with what the market will buy. That is essentially what we are doing.

Senator KASSEBAUM. Congressman Williams, do you have any questions?

Mr. **Williams**. I have no questions. I do, again, appreciate the opportunity to participate. I am going to have to leave. I have enjoyed the testimony.

Senator **Kassebaum**. I would just like to ask one more question about Eximbank funding because it has been mentioned several times and we all agree on the importance of that funding. What one or two top suggestions would you have for reordering the program so it would benefit general aviation more significantly than it has? You mentioned one way I believe, Mr. Neuburger.

Mr. **Neuburger**. I mentioned first that the Eximbank be adequately funded so that it can consider general aviation programs. No. 2, that it lower the ceiling. Right now the ceiling is $5 million. Many general aviation programs that have to be funded simply are below $5 million. So that ceiling should be significantly lowered or eliminated. And I think Eximbank should not be enjoined to walk away from a military customer because he wears a uniform and wants to buy training airplanes or wants to buy a flight inspection airplane or an ambulance airplane or some other special mission airplane which is not related to any lethal military activity, but is simply operated in many foreign jurisdictions by the military because that is the only government authority that operates airplanes, especially in the Third World. I think we are depriving ourselves of very important markets there.

Senator **Kassebaum**. Mr. Lair.

Mr. **Lair**. Actually, Eximbank financing has not contributed materially to overseas sales as far as we are concerned primarily because of the direction of the bank and size of the loans and our general production.

Senator **Kassebaum**. Would it benefit if there was a reordering?

Mr. **Lair**. If it were possible to finance lower amounts I think it could be of assistance to us. But traditionally Eximbank has been pretty much involved in the multimillion dollar equipment.

Mr. **Stimpson**. We have seen a tendency maybe even to go higher on the loan ceiling instead of lower with decreased funding.

Senator **Kassebaum**. I think you are absolutely right.

Mr. **Lair**. If I may take 1 minute on one point that I guess bugs me. You sit here and listen to us all talk to ourselves. You get the implication that we have given our technology away and that we are being whipped to the ground by international manufacturers and designers in the aircraft industry. I want to take violent exception to that. I still think we build the finest airplanes in the world. I think we have the finest technological base to build airplanes from. I submit to you, most of them are using our engines, our avionics and the other products that we have developed over the years. I do not think we have given away anything of any consequence in the aviation business because it is primarily knowhow and manufacturing skill and engineering skill we have. We still have it. We just do not want to lose it. We want to hang onto it. We do not need a lot of help. You started to ask a question a minute ago, Dan, about NASA. The Government is going to have to do whatever they have to do with the NASA budget as far as adjusting the budget is concerned. We are just hopeful that the little bit that we ask that NASA do for the general aviation industry does not get decreased any more than the overall budget. If you are going to take 10 off the top, then take 10 off of ours and we will live with it along with everyone else. We do not require an awful lot out of NASA. We would like to see them do some particular things. But I am sorry. I get wound up. I am not bowed by all of this international competition.

Senator **Kassebaum**. Good for you. That is why Cessna will come through with flying colors. On that positive note I think we will close the morning session. We will reconvene at 1:30. I know Dan and I would like to both express our appreciation for this excellent presentation. Thank you.

[Whereupon, at 12:05 p.m. the hearing was adjourned for the luncheon recess to reconvene at 1:30 p.m.]

AFTERNOON SESSION

Mr. **Glickman**. Welcome to the second half of our hearings today. This morning we heard from a commuter aircraft company that is going to attempt to go into business in Ohio, as well as the Congressman from that district.

We also heard from the Deputy Administrator of NASA, as well as a general aviation panel composed of management and union representatives talking about general problems affecting aviation.

This afternoon, we will have a series of three panels. First on aviation technology. The second, a Government-industry panel. And the third one is a commuter aviation panel.

Then we will close with testimony of Dr. Stephen Piper, who is with the Office of the U.S. Trade Representative in Washington.

So if our first panel would come up, that is Dr. Rodgers of Wichita State University, and Dr. Roskam from the University of Kansas.

STATEMENTS OF DR. JAN ROSKAM, DEPARTMENT OF AEROSPACE ENGINEERING, UNIVERSITY OF KANSAS; AND DR. EDWARD RODGERS, DEPARTMENT OF AERONAUTICAL ENGINEERING, WICHITA STATE UNIVERSITY

Dr. **Roskam**. Thank you very much, Senator Kassebaum and Congressman Glickman, for inviting us to this set of hearings.

What I will do is read the answers to the five questions that were raised in the letters we received before the hearings. If you have any questions, ask for clarification.

Your first question was how can Government assist private enterprise efforts in aviation without assuming their role or diminishing healthy and competitive activities? I have five points in answer to that question.

(A) The first one, I guess is kind of blunt. It says: regulate only in situations where abuse by private enterprise so dictates. Otherwise, stay out.

(B) Provide liberal tax incentives to stimulate corporate spending in research and development [R. & D.] and research and technology [R. & T.] areas.

(C) Fund NASA in fundamental aeronautics R. & T. area at much higher levels than is done now. Give the NASA advisory committee structure the power to see to it that this type of R. & T. money gets properly spent in aeronautics. Encourage the aeronautical engineering component of NASA to go back to the NACA way of operating.

(D) Discourage unfair competition or trade barriers in foreign countries.

(E) The fifth point is, I believe we should provide companies with tax incentives to start funding research done at universities.

Your second question was what is the current true state of our aeronautical capabilities, as compared to foreign competitors?

I have answered that in terms of general aviation and in terms of commuters separately. First, general aviation. The U.S. industry is the undisputed leader in general aviation production and sales.

As we heard this morning, GAMA has provided the Senate and House Committee members with all the impressive statistics which show this. Serious competition exists only in the area of business jets—France, England, Japan.

Because of aggressive R. & D. policies of Japan, Brazil, and Europe, there are strong indications that the position of leadership of U.S. industry may be lost in a decade.

Particularly worrisome areas are: Business jets and business turboprops.

There are signs that several foreign manufacturers are developing their own advanced product lines. We all know that most of them, of course, are financed by their governments.

The second area that I split this question into is the area of commuters. In the commuter area, the U.S. position is downright bad when compared to foreign competition. And I think that came out this morning, as well.

In view of the expected large international and domestic market for commuter airplanes, this represents a serious threat to our aircraft industry by 1990.

Why is our situation so bad? Well, there are a number of reasons. No. 1, I think there is a certain amount of lack of foresight by domestic manufacturers: They simply let this market get away.

No. 2, very aggressive financing of R. & D. in this area by foreign governments. This resulted in Australia, the Netherlands, Germany, Canada, United Kingdom and Brazil now simply having the right product on the market at the right time.

There has been in my view a lack of support from manufacturing representatives on the NASA aeronautical advisory committees in pushing NASA into this arena; in terms of research and technology and research and development.

It is not yet too late to do something about this. New commuter efforts which are being pushed by Beech, Piper and Fairchild—and this morning we heard also from the Commuter Aircraft Corp.—are indicative of that.

However, the technology base used in their new airplanes is essentially already obsolete. This will tend to allow the foreign manufacturers, in my opinion, to keep the edge they now have.

It is of interest to reflect on why we are No. 1 in aviation in general and not just in general aviation. I believe that there are three reasons for this and I believe these reasons are about equally important.

No. 1, the free enterprise system.

No. 2, NACA-NASA Government-subsidized research and technology in aeronautics.

No. 3, fallouts from military developments.

And I firmly believe that if we falter in any one of these three areas, I believe we will rapidly lose our No. 1 position.

The free enterprise system in general does not motivate companies to do far-out nor very high-risk research. But the free enterprise system is very efficient in capitalizing on applicable military and NASA research results.

So we have to keep those coming to keep the system alive.

Your third question was, what are our assets and liabilities with regard to basic aeronautical research and development capabilities and international trade policy?

(A) Assets: I believe our biggest asset in this area is NASA. As pointed out this morning, NASA has very significant test and research facilities. They are still the best in the world. However, they are sadly underutilized.

And I agree with the statements made this morning to that extent. NASA also has a very competent research staff in aeronautics. Over the last years, this research staff has been more and more pushed into the role of project management instead of a role of inhouse research.

(B) Liabilities, the second point of your question: Well, here are some of the liabilities the way I see it. Low research and technology expenditures by domestic manufacturers relative to what I believe to be desirable to stay in front.

Threat of "European NASA," I don't know whether you have been following what is going on in Europe with this regard, but they now have an organization that was established about 6 years ago. I believe it is called Garteur, which stands for Group for Aeronautical Research and Technology in Europe, and the objective of the group which now has a rather detailed organizational structure already is to clearly establish a European equivalent of NASA.

That will drastically change the still positive edge we have in aeronautical technology unless we increase our R. & D. spending in that area.

The third liability that I see is that the Europeans, Japanese, and Brazilians have recognized the value of a healthy aeronautical industry. Their governments are clearly spending significant amounts of money in research facilities and in aeronautical education, and I'd like to quote some examples, if you don't mind.

One of the most important examples in Europe is the new Dutch-German very large, low-speed wind tunnel financed by Holland and Germany, together, and operated by both governments together.

Second, the very large and impressive, I might say, new production facilities in Italy (south of Naples for Aeritalia) and in the north at SIAI-Marchetti and Fiat.

Brazilian ITA and CTA. One of them is nothing but their equivalent of NASA, and another is a completely government-sponsored educational facility, where they will create the aeronautical engineers for Brazil for the future.

In aerospace education, and here is another one of our liabilities, the United States is running a grave risk of "greying" of competent aerospace engineering faculty.

The average age of aerospace faculty is simply getting alarmingly high. We are getting old. We don't seem to be able to replace the old people with the young people. This fact, I believe, is made worse if fewer research grants are allowed to flow from NASA to universities.

This is a process that has been going on for a number of years. There are no significant efforts being made to insure a "transfer" of experience and knowledge to younger engineers and "new-hires."

I have on several occasions seen these younger people propose research already done. One of the reasons for this is that they were not made aware by the older generation people.

There is not a purposeful transfer of knowledge and experience taking place. This is going to result in waste in the future if we are not careful and manage to change this.

You also asked the asset and liability question in the area of international trade policy. I decided that I wasn't very competent in that area, so I am not going to say anything about it, and leave that to GAMA and perhaps to Mr. Piper.

Your fourth question, specifically in which areas or programs should government-sponsored aeronautical research and development be emphasized?

What I have done, and I won't bore you with the detailed technology list that I have come up with, what I have done is in the area of basic research and technology listed a rather large number of very specific technology areas where I believe NASA should increase its emphasis in R. & T. and in R. & D.

Then your last question, specifically, what actions should the Government take to enhance the private sector's ability to compete effectively in the world aviation market?

I have three points there. No. 1 point, you have heard several times today. (A) Eliminate unfair competition from abroad. If we cannot convince foreign governments to change their way of treating American manufacturers when they try to enter those markets on equivalent, fair basis, then maybe, and I am only saying then maybe, eliminating unfair competition may have to take the form of vastly improved tax credits and faster investment write-offs to offset that.

(B) Promote and enhance NASA's role in the research areas indicated before, and which I promised not to read to you in detail.

Finally, create a center of excellence in general aviation research at the University of Kansas. Of course, being from the University of Kansas, I feel that should be located at the University of Kansas. The NASA-university-industry consortium—such as NASA Langley, the University of Kansas, Beech, Cessna, Gates-Learjet, with KU as the program manager—then add other universities and companies might be added as programs develop.

I believe strongly we should involve the Department of Aeronautical Engineering, Wichita State University, directly in the development of such a center for general aviation.

Mr. GLICKMAN. Thank you very much, Dr. Roskam. Why don't we hear from Dr. Rodgers now, then we will ask you both questions.

Dr. RODGERS. Thank you, Congressman Glickman, Senator Kassebaum.

I will paraphrase my written statement. First, I would like to relate some of my mental responses to some of the remarks made this morning by different panel members as well as by Senator Kassebaum.

One of the things I noted this morning was the statement I kept hearing repeatedly, "We all know." I essentially said the same thing as I was trying to answer the list of committee questions Dr. Roskam just responded to. As I attempted to respond to the questions I would say to myself, "Oh, but they know that."

So I ended up by not directing myself to your questions, but instead am bringing a new issue which I believe is critical. Since you did not pose the question you probably are not aware of the problem.

Senator Kassebaum also made the statement that she did not want to "preach to the choir." She wanted to expand her audience. From that viewpoint, I would like to consider myself a visiting preacher to this choir. Although I have a little different theology I want to preach. I do have the same goals in mind that you have. I want to make you aware of another pitfall on the road to salvation.

Before I do that I want to summarize a couple of points regarding the questions that you had posed. In my opinion, a mechanism does exist through NASA, NSF, and other Government organizations for funding research, and at the same time allowing industry to pursue the competitive aspects of their development work.

However, those agencies need more funding for a number of reasons. One is to continue progress in technology. Another is to have funding available for supporting our graduate students, the source of our research engineers and teachers and the future manpower for technological growth.

Another point I would like to mention is the neglect of basic research in years past. I disagreed somewhat with some of the remarks made on basic research this morning. Someone stated "basic research pointed toward general aviation." If research is pointed toward anything then, in my mind, that is not basic research. That is applied research. We do need some basic research. We have been neglecting this for the last 15 or 20 years, maybe longer than that.

The invention of the vacuum tube started a whole new technology and industry. The same with the transistor. They were not developed for the portable radios that we have or television sets. They were developed as novel devices by themselves and later found to have many applications.

If we start pointing all research toward something, we will be hurting future technological growth. We will not be opening up new avenues of knowledge that lead to new technological developments.

These are two comments I wanted to make and did in my written comments. There was a remark made this morning by Mr. Neuburger regarding the lack of trainers due to decreased aircraft production possibly leading to a a lack of pilots for the commuter industry.

Dr. Roskam just mentioned the depletion of NASA engineers due to various factors. Both his and Mr. Neuberger's remarks alluded to what I really wanted to address: our manpower situation.

I was at a technical meeting in Phoenix, Ariz., about 2 years ago and sat in on the panel discussion when they were trying to project the directions engineering in the aviation industry would be taking in the next 10 or 15 years.

During the question period, I stood up and requested permission to come up to the front and address the assembly. I told them that things were happening that may not let them carry out their plans because they may not have the manpower to do so.

I see the same thing this morning: Potential manpower problems in the general aviation field and commuter field. We can see this directly now, a potential shortage of people trained and educated in engineering in general and aeronautic engineering in particular.

NASA is trying to hire engineers, but they are having difficulty. Industry is trying to hire engineers and they are having difficulties. Universities are trying to hire engineering educators, and they are having difficulties. It's not going to get better. There is a reason for this.

I took a survey of industry a few years ago as to their needs. They all told me that there were going to be a lot of restraints. A large number of the engineers educated under the GI bill after World War II are all approaching retirement age. They are going to be faced with retirement very soon.

Where will we get their replacements from?

We have a lag in the educational field of about 4 years. Our students respond to current trends, not to what may be occurring at the time of their graduation. Our students responded to the declines in the economy and consequently in the aerospace industry that occurred about 1969 or 1970. As a result we had a tremendous drop in engineering enrollments which persisted for a number of years. Prior to this time, we had to build up our faculties to handle record enrollments. I interviewed at W.S.U. in 1969. When I interviewed, there were 20 people on the faculty in the aeronautical engineering department. In 1970 when I came here, they were down to 12. Since then, we have decreased to seven.

Nationally, engineering enrollments started decreasing about 1971. About a year or two ago, they started increasing. Now our enrollments in engineering are reaching record highs, exceeding the 1969 levels.

Our faculties, however, are still at the same levels. In our case, our 7 faculty are trying to teach the same number of students that we taught when we had 20 faculty. It is impossible.

As a result, some schools are restricting enrollments. Ohio State is one. About 2 years ago, Ohio State started limiting engineering enrollments because they couldn't get enough teachers.

Why not increase the faculty? Well, they are not available because graduate student enrollments decreased during those years. Faculty come primarily from the graduate student ranks. One Ph. D. graduates and about 20 of us try to hire him. Faculty are also leaving for other reasons including higher pay in industry. There was an article in Newsweek about a month ago on this issue.

So our faculty is being wooed away. Some of our people have gone out to local industry at higher pay than we could affer them.

Another person on our faculty started his own consulting business, making about five times as much money as he was making as a faculty member.

We also have salary compression. We hire new inexperienced faculty at increasingly higher salaries. The salaries of our experienced members are not, however, increasing at a comparable rate. As a result, the salary difference between the two is decreasing. This is presenting a problem. It is not much of an inducement for somebody to go into graduate school and then go into teaching. We see the problem getting worse.

The American Society of Engineering Education has recently staffed a new position and is undertaking a new endeavor. They now have staff who will be exploring this problem to see what can be done about it. The staff position has been funded by an industrial concern. I can't remember which one.

I would like to see the general aviation industry, including this committee, become aware of these problems because it certainly can have a great impact on what you are going to be doing in general and communter aviation.

We are not alone. Our problems are also the problems of industry. We are supplying their engineers.

There are a number of things we can do. One thing we can do, in my opinion, is to get involved in thinking about our staffing problems and bring some original ideas to us.

Another thing would be for government and industry increase university research contracts. Not only increase the contracts, but increase the dollar amounts we can pay our students so we can compete with industy for graduate students.

Right now our bachelor degree graduates are going out to industry at about $22,000 to $27,000 with no experience.

We ask a bachelor degree graduate to come in and work on his master's at somewhere near $5,000 and the Ph. D. candidates to work at something less than $7,000. They are smart enough to know that from an economic viewpoint it is not going to pay off in the long run, especially when they look at the salaries being paid at these universities and those being paid in industry.

So that is the problem. It is what I wanted to bring this to your attention. It certainly bears on the future of commuter and general aviation as well as, I think, the welfare of our country, because it also holds true in all other engineering fields as well.

If I can make a recommendation, it is that the people in industry and the people in government be receptive to the individual from the American Society of Engineering Education, when he comes around to see you. I am sure he will be asking for your help and advice on our engineering staffing problems.

If anybody's interested in finding out who this person is. I will be happy to help even though I don't know myself who this individual is as yet. I just saw this as a ASEE news item. Write to me or see me. I will try to get his name and get him in contact with you.

[The prepared statement of Dr. Rodgers follows:]

COMMENTS ON THE FUTURE OF GENERAL AVIATION AND COMMUTER TECHNOLOGY

Presented at

The Aviation Sub-Committee Joint Hearings

August 27, 1981, Wichita, Kansas

By

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The Aeronautical Engineering Department of Wichita State University is pleased to have been invited to participate in the deliberations of this committee. We have a strong interest in the health and welfare of aviation and in particular the General and Commuter Aviation areas. We feel this industry contributes significantly to the welfare and economic health of our country. We believe there is a problem we are facing which needs to be called to your attention. This problem poses a threat to the vitality of this industry. We will address most of our remarks to this problem.

There is no dearth of technical problems whose solutions would benefit the technological progress of general and commuter aviation. A mechanism exists through NASA, NSF and other government organizations which allows for the development of necessary technical information to solve these problems while not reducing the competiveness of developments in the private industry. A detailed list of short and long term problems can be developed without difficulty. This list may differ depending on the group of individuals involved and the problems they are facing at any time. All would however agree that sufficient funding was not available to persue solutions to all of the problems. They would also decry the lack of support of basic research which serves as a foundation for the development of engineering technology. The trend for the last two or more decades has been to fund only applied research and not basic research. Since this committee is involved with policy determination and not technical details only two points are made here: 1) Existing government agencies can address the technical problems but more funding is needed and 2) More support of basic science is needed for long term advancements.

I would like to at this time discuss a problem we in education are facing and which will become more serious as time goes by. This problem deals with the shortage of engineers required by industry coupled with a shortage of engineering educators. It is important that as many influential people in government and industry become aware of and involved with this problem.

We are and have been faced with a shortage of engineers not only in the aerospace industry, but in other technological industries. Perusal of advertisements in the newspapers and technical journals shows an increasing demand for engineers. Advertisements for engineers take up pages and pages of these newspapers and journals. These advertisements speak of glowing opportunities and exotic living conditions. They are competing for a dimished supply to demand ratio of these highly skilled people. Why is this happening? How does the future look? What can we do to alleviate the situation?

If you ask anybody in industry, government or engineering education you will find that the average age of their employees is increasing yearly. A large number of engineers entered the profession shortly after the second World War having obtained their education under the GI bill. These individuals are now approaching retirement age and will soon be retiring at an increasing rate. The complexity of technical problems facing the world has also increased the demand for engineers. Favorable news and advertising regarding the field of engineering has caused a large number of students to apply to engineering schools. The recent space shuttle success has also stimulated increased aeronautical engineering enrollments. Universities are being inundated by applicants for Engineering Undergraduate Programs. A problem has arisen because of this demand.

In the early and mid 1970's engineering enrollments especially aeronautical engineering enrollments decreased drastically. This resulted in decreases in the number of engineering faculty throughout the nation. Graduate program enrollments also decreased. As a result of the decreased Ph.D. enrollments since then the increased needs for faculty presently required cannot be met. Competition for those available is increasing at an alarming rate. As a stop gap measure many schools are restricting engineering enrollments. The problem, bad for the last two or three years, is increasing rapidly. A national ad for a faculty member usually elicits few responses, say three to five. Many of these are unqualified or are foreign nationals. This has great portents for increasing problems for industry and our country. Why is this so, and what can be done about it?

Faculties of colleges of engineering as well as other colleges come from the ranks of graduate students especially those persuing a terminal Ph.D. degree. As stated previously, graduate enrollments have decreased over a number of years with a larger number being foreign nationals studying in this country. Studies by the American Society of Engineering Education, The Deans of College of Engineering and other organizations have pointed one cause to be the low stipends paid to graduate students.

An Engineering Bachelor of Science graduate is being enticed by the high salaries offered by industry. He is increasingly choosing to enter the field of engineering directly rather than to proceed to graduate school. The country is therefore loosing a large number of highly talented individuals leaving their potentials unexploited. From the students viewpoint it does not take much economic sense to realize that the total salary difference over his lifetime if he undertakes 2 to 6 years of graduate school will be hard to make up. Thus fewer and fewer students are opting for full time graduate studies. Recent enrollments have shown increases. An examination of the records however will show an increasing portion of the full-time graduate students to be foreign nationals. This in turn means most of our future engineering educators will have to come from the ranks of foreign nationals. This would present additional problems since the technological background of their youth is quite different than that of the average American graduate student who grew up surrounded by technological devices. The foreign national does not have the "feel" for engineering that the American student has. This can reflect on the quality of future engineers. Increasing accreditation requirements for the teaching of ethics and professionalism can also be affected. The ethical and cultural environment between that of the American professional and for example, the far eastern culture differs significantly.

Engineering schools are also facing a problem of obsolesence of equipment in laboratories. This will definitely affect the quality of engineers graduating from these schools. The rapidly changing technological field makes it difficult to keep up with new equipment. However since fundamentals should be stressed only basic equipment should be used to demonstrate these fundamentals. It is highly impossible for colleges and universities to keep all of the equipment up to date. The problem is that available fundamental equipment in the universities is approaching obselence and needs to be replaced.

What can be done to alleviate both problems mentioned? It is very important for industry and government policy and decision makers to be aware of the problem that universities are faced with in 1) obtaining highly qualified faculty and 2) in obsolescence of engineering laboratory equipment. These can have a great bearing on their goals and directions in aviation as well as other technological problems. As we in the educational field see it one solution to the first problem would be to make the graduate students stipends more attractive to the American graduate student. This means that research contracts negotiated between universities and government organizations such as NASA and NSF should allow for larger stipends. Total funding available should also be increased in order to support enough students to fill present and future faculty positions. Faculty salaries must also be made competitive with those in industry.

Perhaps some novel ideas may be generated by having people from outside the universities pay some attention to the problem faced in staffing engineering colleges. The same holds true for obsolescence of engineering laboratories. It is essential that increasing help such as provided by NSF equipment grants become a priority item in our government funding. Industry can also play a role by providing equipment grants to universities and colleges rather than passing down their obsolete equipment. It might in the long run be the best investment toward their recruiting problems.

The message I have tried to convey here is that the health of the field of General and Commuter Aviation depends strongly on Engineering manpower. The development of the required number of engineers required by the industry and their quality is in jeopardy because of increasing problems in maintaining and obtaining qualified engineering faculty. The problems roots are in having inadequate graduate students for the Ph. D. programs, inadequate faculty salaries and obsolete laboratory equipment. Our problem is also your problem. We invite your participation in its solution.

Mr. GLICKMAN. Thank you very much, both of you, for your testimony. I would like to ask you, Dr. Rodgers, you say the number of engineering students was going down. I assume you mean bachelor degree students. Then a few years ago it started to rise.

To what do you attribute the recent increase in the number of engineering students?

Dr. RODGERS. Well, a number of reasons. The press is good to us. They talk about the fact that most people who are graduated from college that receive most of the job offers come from the field of engineering, computer science, or business administration. We also recruited for students in the high schools the last 6 or 7 years. The improved economy has also helped somewhat.

The Space Shuttle is going to result in an increase in students in aeronautical engineering. It already has.

Mr. GLICKMAN. Do you think that the limits on Government pay that are imposed on all agencies, but particularly NASA, are making it impossible for NASA to compete with the private sector for competent qualified engineers?

Dr. ROSKAM. That certainly hasn't helped at all. The hiring freeze itself at NASA is very unproductive, I would say. Another thing that I observed over the last 12 years at NASA is the fact that every time there is a new administration, there is a new Administrator and a new Associate Administrator, and they find it necessary to reorganize things.

Then there are an awful lot of people involved in that reorganization, and these people are not doing productive research. Every time there is an OMB panic, they pull off an awful lot of competent researchers to help in formulating financial plans and financial details and testimony in Washington, D.C.

That is taking away a lot of very competent people from the tasks they are really supposed to do. There is an unbelievable dilution of effort within NASA because of all these organizational system-imposed pressures.

And then, worst of all, there is the fact I already signaled, that the experienced people are leaving NASA by droves through early retirement. And there is no program in place to transfer their knowledge and experience to the younger people.

There is no purposeful program in place to accomplish that. We are going to pay the penalty for that in terms of wasted efforts in the future and in terms of lower quality of research.

Dr. RODGERS. I would like to address my remarks to the problem regarding the younger group of NASA staff. With the increased salary requirements for engineers it is difficult to hire a new graduate. I think the problem is not in the upper GS levels but in the low part of the GS salary range. The starting salaries are lower, much lower than industry.

Once you get beyond 2 or 3 years of experience, then there is not that much of a gap.

I think the combination of lower salaries plus the availability of engineers makes it more difficult for the Government agencies to compete.

I think they do have certain other advantages. The educational benefits in NASA are much better. That is how NASA can compete for bright graduates. The fringe benefits they have, especially the educational benefits, are good.

Mr. GLICKMAN. One final question and I will turn to Senator Kassebaum.

I have been interested in the idea of giving NASA the role of doing some basic automobile research. They already do it at Lewis Research Laboratory, or at least they are the main contracting officers.

How do you feel about that? Do you think they have enough to worry about in aeronautics without getting into redesigning or rebuilding the car?

Dr. ROSKAM. I have felt from the beginning that any dilution from aeronautics is a mistake. All the side excursions like the truck business or car business or energy engineering business, for that matter, is detrimental to their number one purpose. That is to make sure that the United States stays the undisputed leader in aeronautics.

Mr. GLICKMAN. Do you agree with that?

Dr. RODGERS. I agree with that statement.

Mr. GLICKMAN. Senator Kassebaum.

Senator KASSEBAUM. Thank you. I would like to comment, Dr. Roskam, just a minute on an earlier answer. I would agree with you 100 percent about wasted efforts sometimes in the paperwork to meet numerous committee requirements, and overlapping of testimony and so forth which I think is very unproductive.

But you mentioned problems relating to early retirement of NASA personnel and not being able to use these people effectively. Why couldn't they be used on the teaching staffs?

Dr. ROSKAM. Some of that is happening, Senator. We have acquired an extremely well-qualified NASA researcher in the propulsion area as a professor at the University of Kansas.

Senator KASSEBAUM. Which I take Wichita State University could use one, too?

Dr. RODGERS. We have tried to get such people to come to us on a visiting or permanent basis. There are problems. When we lose a position, we don't get it funded at the level we lose it. We get it funded at a lower value. So if we lose a full professor, we get the position funded at an assistant professor level. It is hard to get someone with experience to come as an assistant professor.

Dr. ROSKAM. It is utilizing their abilities elsewhere and that part is good but it isn't helping transferring their knowledge and experience within NASA.

Senator KASSEBAUM. I would like to ask both of you what areas you are concentrating on right at this moment in both of your programs at the universities. What do you lend the greatest importance to?

Dr. ROSKAM. In terms of research center?

Senator KASSEBAUM. Well, is research one thing you are targeting as the most important right now?

Dr. ROSKAM. Well, the university, of course, is dedicated to teaching, service and research. And they are almost equally important. The reason research is so important is that is the only way that you can retain qualified faculty and attract qualified students. So you must do that.

The areas that we are concentrating on are virtually all in the general aviation area. To be specific, an interior noise research program and computational aerodynamics.

We are working on an advanced configuration commuter airplane program. By the way, these are all funded by NASA, I am happy to say. And a program on icing research aimed at general aviation airplanes.

Dr. **Rodgers**. In the Aeronautical Engineering Department at WSU, we are primarily involved in general aviation wing development through NASA. We are also involved in the wind energy technology with NASA Lewis Laboratories. There are a lot of other areas we would like to get into but a lot of the actual work is done with graduate students under the direction of faculty. That is where we are having difficulty, in attracting graduate students, as I mentioned.

I think every other university in the country is, too. The importance of research is in graduate programs. We have a real good undergraduate program. We do need more graduate students to develop the graduate program. One of the important things about research, at least at our university, and I believe it is true at the University of Kansas as well, is the obtaining of funding for laboratory equipment. Our capital equipment funds are those overhead funds we get from our research.

The State does not allocate capital equipment funds. That is another crisis that has arisen in education, which I mentioned in the written testimony. The laboratory equipment we are using is dated and is becoming obsolete.

So we are faced with large financial problems to replace this equipment. Thus the research is important from another viewpoint, since the State does not fund equipment in our case.

The equipment we are talking about is really basic laboratory equipment. We have, for example, for some universal testing machines that are probably 40 years old or more. This is what we are educating your engineers with. This will affect the product we have coming out for you to hire.

Senator **Kassebaum**. I will ask you both, if you had a crystal ball to look at the future, what would you predict would be the most important technological breakthrough that we would need to achieve?

Dr. Mark mentioned this morning reduction of operating costs, which I think we would all agree with.

Dr. **Rodgers**. The most important thing I would like to see occur would be continuity in our research and goals. We lack continuity. It means more expenses, increased staffing problems, inefficiencies and waste of manpower.

Things seem to change from day to day.

Dr. **Roskam**. I agree with the continuity point very strongly, Senator. We must have a program of continued well-funded research, if we intend to stay ahead in aeronautical technology. But I can also give you a specific answer to your question.

It ties directly in with what Dr. Hans Mark said this morning. To achieve energy efficiency in airplanes and thereby lower operational costs, we must obviously work in the propulsion area.

NASA does have a very good, although strongly underfunded program in that area. But we must also leapfrog the existing state of the art.

Some of the industrial people around the table here mentioned that this morning, I believe in particular, Mr. Harry Combs mentioned that. The sad thing is, though, that I don't see a single U.S. company attempting this kind of leapfrog. Yet the technology is ripe to do that.

The technology is ripe to launch advanced configuration airplanes which do not have the tail in the back, which do not have the propeller swing right in front of the passenger cabin which makes it noisy and uncomfortable, airplanes which don't have bad ride characteristics like all the commuter airplanes have today and those that are planned, including the Ohio airplane.

The technology is available to do this job better if we can get the existing knowledge of NASA research and developments planned for the next 5 years integrated with these designs at an early stage of the game, like within the next 3 to 5 years.

This is feasible. If we do that, we will beat the foreign competition.

Senator **Kassebaum**. Mrs. Lehman mentioned that, as well, the leapfrogging. Do you sense a certain reluctance on the part of industry to take a gamble?

Dr. **Roskam**. Yes, I do, Senator. If I were chairman of the board of Cessna, I might be having the same reluctance, because we are talking about a large number of unknowns that need to be combined in one new airframe.

That constitutes taking a risk. And there is always, when you do that, the risk that it will not pan out. In that case, the company goes broke. This is why I believe this cannot be accomplished without Government assistance in the form of increased R. & D. funding of NASA.

Senator **Kassebaum**. Thank you.

Mr. **Glickman**. I would just close by saying that I see parallels with the automobile industry here. The fact is that we have seen over the years that the major companies have not taken the financial risks which might lead to long-term gains. And I hope that we don't see the same results. That is, it almost seems that it is impossible for a large company that's been in business for many years and which deals with all sorts of unknowns, such as technology changes and competition, to take that kind of financial risk. They might have done it 40 years ago, but may not do so now because of these questions.

This summer I went through the General Motors Technical Center. There is, perhaps, only one company in the world that has the capability of taking the risks in the automotive area which might result in a technological breakthrough and that is General Motors. And they are not doing it. It worries me.

Dr. **Roskam**. You are absolutely right and I think it is a very well-drawn parallel.

Senator **Kassebaum**. Thank you.

Mr. **Glickman**. We thank you for your excellent testimony.

Dr. **Roskam**. Thank you.

Mr. **Glickman**. Our next panel is a government-industry panel. We have Mr. Richard Upton with the Wichita Area Chamber of Commerce, Mr. Don Segner with the FAA.

I think they are both here.

STATEMENTS OF RICHARD UPTON, PRESIDENT, WICHITA AREA CHAMBER OF COMMERCE, AND DON SEGNER, ASSOCIATE ADMINISTRATOR FOR POLICY AND INTERNATIONAL AVIATION, FEDERAL AVIATION ADMINISTRATION

Mr. **Glickman**. Since your statement is shorter, Mr. Upton, why don't we take yours first. It is a pleasure to have you both here.

Mr. **Upton**. Senator Kassebaum, Congressman Glickman, I am Richard Upton, president of the Wichita Area Chamber of Commerce.

On behalf of our 3,200 members, we wish to express our appreciation to you for bringing this hearing to Wichita. It gives recognition to the fact Wichita is the air capital of the world and has facilitated the leadership bringing testimony to you.

Our statement is reasonably short. We believe it is important that America maintain its position of preeminence in general aviation. In exports, this industry has and is making a significant and positive contribution to the national balance of payments.

The industry also makes a positive contribution to the employment of American workers. We in Wichita are perhaps in the best position to recognize this fact. Our three general aviation companies employ a sizable number of Wichita area people—about 22,000.

They also indirectly account for additional employment due to orders placed with their suppliers. We understand approximately 25 to 30 percent of those jobs depend on the companies' continuing success in the export market.

Because the general aviation industry has enjoyed success abroad, America's tax receipts at the Federal, State, and local level have also grown. Industry sales abroad have also provided profits to thousands of subcontractors across the Nation due to their purchase of goods and services.

The general aviation industry also has benefited this country because of its views regarding the improvement of the quality of life. Those standards are measured in the personal leadership, volunteer hours and funding of worthwhile civic ventures, including higher education—public and private—all of which we believe has accrued to the public benefit.

We believe the Congress and President have recently taken steps that should prove positive for general aviation. Those actions, which enjoyed the vigorous support of this chamber of commerce, include accelerated depreciation schedules and the reduction of Federal spending.

Additional steps that would be helpful include:

1. Continuing recognition of the importance of general aviation to our national economy and balance of trade. We urge equity of opportunity in foreign trade. When our general aviation industry finds entire national markets closed or restricted, the United States should act decisively to insure markets are reopened.

This can be done, we believe, by pursuing a policy of economic strength.

2. Continuing to be alert to opportunities to further strengthen the Eximbank.

3. Recognize the important role that general aviation exercises in providing a significant portion of America's daily transportation needs, and insure the skies remain open at all times on an equitable basis.

4. Utilize the funds in the aviation trust fund to improve the Nation's airports, including the development of additional reliever airports where needed.

Thank you for receiving our formal views and recommendations.

I think I would like to add, if I might, two comments relative to the strength of general aviation. Some 5 years ago now, or 6, we made an approach to the Treasury Department to ask for a port of entry to Wichita. It was one of the few the Department opened at that time.

It was done so on the basis of the number of shipments out of this community, a majority of which are related to general aviation. The positive impact of exports from this market area, because of this industry, is significant, and that office, which now has full customs services, is certainly making money for America.

The other area I wanted to speak to was a recollection—and I might say to those who are not as familiar as Senator Kassebaum and Congressman Glickman, I have had this responsibility for the last 13 years in Wichita—on two occassions we have seen some potential difficulty arise because of a lack of understanding of the importance of general aviation.

First was an embargo on fuel when there was to be a considerable reduction in flights to be allowed on general aviation on the assumption it was not a business tool. It was not known frankly what its value was.

Perhaps that oil embargo was of great benefit to the industry. But I would ask that the Government and others remain alert to that issue.

In my 13 years, I have seen this industry remain viable and be able to handle most any kind of issue that comes before it except those things that they can't control.

One of the things they nearly couldn't control was the determination at that time that general aviation wasn't a very positive or important aspect of this Nation's economy in moving people. As a professional, in my judgment, we will see more need for general aviation and commuter air service, with the further diversification of industry moving away from central locations to the smaller cities of America that have no, or very limited, commercial air service.

To maintain the growth of the States throughout the Southwest and Midwest, we have got to continue to insure that the skies remain open so those communities can have good air service.

Without it, we simply won't enjoy a good economy for those communities. Thank you.

Mr. **Glickman**. Thank you, Dick.

Mr. Segner, it's a pleasure to have you here.

Mr. SEGNER. A pleasure to be here, Madam and Mr. Chairman. I am pleased to be here today to discuss the Federal Aviation Administration's views on the future of general and commuter aviation, and the proper role of the Federal Government in promoting those industries.

While the focal points of this hearing—technology and international trade as they affect commuter and general aviation—are of natural interest to the FAA, they are not, as you know, directly within the scope of the FAA's primary responsibility.

That responsibility is to insure the safety and efficiency of the national airspace system and vehicles that use that system. Consistent with our mission, FAA's technological engineering and development programs concentrate primarily on enhancements to the air traffic control system and safety improvements to aircraft.

At the outset, I want to emphasize that the aeronautical capabilities of aircraft manufactured in the United States measure up to any in the world. While there are projections that the U.S. manufacturers' share of the world market for commuter-type aircraft will decline over the next decade, this is not due to any decline in the quality of aircraft produced in the United States.

Rather, the U.S. manufacturers have not concentrated on large commuter aircraft, because of the lack of a defined domestic market for these aircraft in the past.

Until a few years ago, U.S. commuter airlines were, with few exceptions, restricted to aircraft with 30 or fewer seats. The Airline Deregulation Act of 1978 raised that by regulation to 60 passenger seats. U.S. manufacturers, therefore, had tended to specialize in the smaller aircraft market and only recently began focusing on the large commuter aircraft.

Foreign manufacturers had the resources to develop larger commuter aircraft and therefore accept the financial risks prior to the advent of a firm U.S. market for these aircraft. Thus, they had a headstart on their U.S. counterparts when this market opened up. However, we are aware that there will be several new United States and joint United States-foreign entrants into this field. We expect that they will be competitive once they go into production. The opportunities for commuter aircraft manufacturers are expanding rapidly. We expect substantial increases in the number of commuter passengers through 1990, and the demand for large commuter aircraft will continue to increase.

While other governments directly fund specific research and development projects aimed at the development of particular aircraft through specific manufacturers, the U.S. Government research and development has been of a more generalized nature. This is due in part to the view that the Federal Government's role is to support long-term, high-risk, but potentially high-payoff, fundamental research in which private industry is unlikely to invest adequately on its own. The application of research to new products is more appropriately the responsibility of the private sector. This is fundamental to the American free enterprise system. Incidentally, through our open and free communications process, much of that same research and development technology base data is available to the foreign countries and therefore the market competitor.

There are clear incentives for U.S. manufacturers to make technical advances. The benefits of short runway use, wake alleviation, and other techniques will lead to aircraft developments that are attractive to the customer, not only in the U.S. market, but in foreign markets as well. At the FAA, we strongly believe that the U.S. private sector is unmatched in its innovative capabilities. We have no doubt that U.S. firms can compete successfully with foreign manufacturers when they set their sights on a specific objective. The Federal Government can help our manufacturers by working to remove barriers to U.S. trade.

We are examining whether the FAA has any policies and regulations which inadvertently make U.S. firms less competitive. In addition to examining and modifying our current regulations, we are looking at the areas of aircraft export airworthiness approvals. In one case, as an example, we are considering a revision to Federal Aviation Regulation part 21.339(1) concerning the sale of restricted category aircraft. This change would permit a manufacturer who has taken such an aircraft outside the United States—on a sales demonstration tour of several countries—to sell that aircraft immediately in any one of those countries. Currently, that manufacturer would have to obtain a special exemption, return that aircraft to the United States, or present it at an approved FAA facility overseas prior to the sale.

We are also reviewing past and present implementation of bilateral airworthiness agreements. The United States is party to 24 bilateral agreements for the reciprocal acceptance of airworthiness certification for imported aeronautical products and components. These agreements are the only practical means by which foreign manufactured aircraft can receive FAA airworthiness certification; and by which engines, propellers, materials, parts, and appliances can receive FAA approval for use on U.S.-registered and certificated aircraft.

Under the reciprocity provisions of these agreements, many U.S.-manufactured products are similarly certificated by airworthiness authorities for acceptance in "bilateral" countries.

These agreements serve a necessary technical need, that is, facilitating safety approval by the importing country's airworthiness authority. They are not trade agreements. These BAWs are intended to minimize duplication of governmental safety surveillance activities and to facilitate the import and export of safe aeronautical products.

Some U.S. manufacturers have expressed off the record concern about delays in the foreign governments' certification of U.S. products. They also allege the imposition of double standards for U.S. aircraft versus the domestic aircraft of other countries. Overly long and expensive quality surveillance of components abroad for U.S. certification/production programs, which may subject U.S. manufacturers to inspection charges and possible added risks of program delays or disruption are also alleged.

The smooth functioning of our BAW's is important to the success of U.S. manufacturers' sales of highly competitive products. Therefore, we are reviewing our present policies with respect to bilateral airworthiness agreements. As part of that effort, the FAA practices in implementing agreements are being compared with those of foreign authorities. Our review will determine if U.S. manufacturers are being fairly treated under all individual airworthiness agreements. The Administrator and I believe that the airworthiness certification process and the implementation of our bilateral airworthiness agreements must not be allowed to become a trade barrier with any country.

We are also examining, with other concerned agencies in the Government, U.S. manufacturers' experiences when doing business in foreign countries. Some national preference-buying programs are broader and more intense overseas than in the United States. This is in part because in other countries the governments are deeply involved in the direct research, development, and production of those products. Moreover, it is important to recognize the possibility that trade barriers such as import quotas, tariffs, and other restrictions can limit U.S. industry access to foreign markets or raise the cost of U.S. companies' products compared to those of the foreign countries' companies.

The benefits of our aviation industry to this country are enormous. General aviation is a critical part of that. We recognize that the continuance of U.S. leadership in this field is essential to our national economy both through direct domestic benefits and the positive contribution to our balance of trade. Aviation is a vital and essential element of both the United States and world transportation systems. We must not allow the competitive edge attained by our U.S. aviation industry to be lost.

Madam and Mr. Chairman, that concludes my prepared statement. At this time I would be pleased to respond to any questions.

Mr. GLICKMAN. Thank you, Mr. Segner. I think Mrs. Kassebaum will have more questions regarding the reciprocal certification issue. But from your statement, is it fair to assume that whole issue is under serious review right now by the FAA.

Mr. SEGNER. It is; yes, sir.

Mr. GLICKMAN. I would like to make one quick comment to Dick Upton. We have had many discussions about the pros and cons of airline deregulation, and I happen to think it was a good idea. But in my judgment, it was through the efforts of folks like Dick and the chamber here that Wichita was able to be one of the beneficiaries of airline deregulation. We just hope that continues. Through the efforts of the commuter aviation industry, air service should continue to improve.

I hope that our domestic companies will be able to introduce commuter aircraft that will be able to utilize those additional routes.

So I congratulate you and the chamber on what you have done in the area of improving air service.

Nancy.

Senator KASSEBAUM. Thank you, Dan. I might say, as long as you commented on airline deregulation, that while I was not in the Senate at that time, I do strongly support airline deregulation.

We have seen some pluses and minuses. I tend to think the pluses outweigh the minuses, but it's been in place long enough now that I think it will be beneficial to us to have a review of airline deregulation and see where it is going.

But that is a bit beside the point. However, I would like to say that I know the chamber, and certainly you, Dick, have taken a real leadership role in recognition that aviation is an industry of great importance to us in Wichita and in the State of Kansas.

I know that both of our offices are always pleased to do what we can to assist in assisting the chamber of commerce.

Mr. UPTON. If I might, Charles Harris is not here today because he is trying a case and could not be excused. He certainly wanted me to convey our appreciation for both your offices' responsiveness.

In the area of deregulation, I have some colleagues who criticize it significantly because their communities have been significantly hurt. When we get into a detailed discussion with them to find out what is it that they are doing about it, I find that they are moaning, mostly, as opposed to thinking about and taking positive action on what can be done.

There is no question that we worked and we worked very vigorously in making deregulation work for Wichita. But it is done with a lot of professional help, and expense and making sure when we speak to airlines, we have the proper economic data.

Deregulation will continue to be an asset to the commuter airlines in picking up the routes the larger airlines can't operate successfully within, anything within a 200-mile route on down.

There are those communities worried about deregulation and attendant loss of service, Madam Chairman. I would say to you it is partially their own problem. I really think we are starting to see responsiveness of the carriers to the issue after really a reasonably short period of time of deregulation being in effect.

The best example of that was United's entry not only to Wichita, but also the midsouthwest region, Tulsa and Oklahoma City. They are being very successful.

One of the reasons they installed service here and in other cities is because we are economically profitable. We are a growth area that enjoys a strong economy and low unemployment.

When you find communities that aren't as economically viable, I don't think we ought to expect that the air carriers are going to provide them great amounts of service.

Senator KASSEBAUM. Mr. Segner, you really answered in some ways one of my main questions to you. And I would join with the Congressman in saying I am pleased to hear the FAA is reviewing the airworthiness and certification process, because, as you know, it was a question raised several times this morning.

One instance, I think that was mentioned a couple of times, the fact that we paid the cost of our team to go to say, Great Britain, to provide certification. Should this not be a cost to Great Britain rather than to us? Do you have any answer to that or is this something you are reviewing?

Mr. SEGNER. If I may, being a new boy on the street, I am going to turn to some notes on that, because it is a little bit complex when you look at the total picture.

It is true that our manufacturers are charged for certifying an aircraft overseas. It is also true that those countries charge their own people for the same certification services that they provide; in other words, it is a quid pro quo. To certify an airplane in the

United Kingdom, they charge a U.S. customer about $66 per 1,100 pounds for certification.

Foreign governments also charge the U.S. customer for per diem and other such expenses. It has also been reported that some countries also charge for the traditional parties they throw. But these countries also charge their own people for the same certification fees. However, in those cases, many of the fees charged to their domestic companies are reimbursed through subsidies of the aircraft. That is where you see one difference.

The second difference is that the FAA does not charge either U.S. or foreign firms for certificates or the certification process. Starting in January 1973, Congress prohibited the FAA from collecting any new fees, through specific language in appropriations legislation. In 1978, the prohibition was enacted as section 45 of the Airline Deregulation Act of 1978. Shortly afterward, that prohibition was relaxed to allow the FAA to charge for airmen and repair station certificates issued overseas. Now, on August 10 of this year, the FAA published a proposal to collect fees for certificates issued to foreign nationals. The dollars aren't great, but we are going to collect some fees.

FAA's existing or proposed fees have now used up all of our existing statutory authority to charge any foreign nationals. Additional authority would be needed to establish fees for airworthiness or type certificates for foreign products.

However, there is a problem. Title IV of the Trade Agreements Act of 1979 requires that the FAA not discriminate between foreign and U.S. applicants in assessing fees for airworthiness or type certificates. Therefore, the law says that for us to charge any foreign applicants for the full cost of these certifications, we must also charge U.S. applicants for the full cost of the certification process.

We do believe, however, that title IV of the Trade Agreement Act of 1979 may allow us to charge foreign applicants for the actual per diem and travel costs beyond those normally required for U.S. applicants. Even so, that is only a minimal part of the certification fee.

We are now consulting and will actively continue to consult with other agencies and industry, and, eventually, Congress on this matter.

Senator KASSEBAUM. Are there any remedies that the FAA has now that you can utilize if you find there are nontariff barriers that have been erected?

Mr. SEGNER. We are, through our review, looking at the safety aspects of the quid pro quo bilaterals. If we find that the purported safety aspects are not, indeed, safety aspects, we will pass that information on to the State Department and the U.S. Trade Representative for appropriate use in negotiations.

If we find there is a difference of opinion on safety aspects, we will bilaterally solve those problems through mutual agreement.

Senator KASSEBAUM. Thank you very much. I think that sounds like a positive and beneficial review that you are undertaking.

Mr. SEGNER. Thank you.

Mr. GLICKMAN. Thank you both for your testimony today.

Our next witnesses are a commuter aviation panel. We have Mr. Alan Stephen with the Commuter Airline Association of America and Gary Adamson of Air Midwest.

Which of you gentleman want to go first? Gary, why don't you go first?

STATEMENTS OF ALAN STEPHEN, COMMUTER AIRLINE ASSOCIATION OF AMERICA, WASHINGTON, D.C., AND GARY ADAMSON, PRESIDENT, AIR MIDWEST, WICHITA, KANS.

Mr. **Adamson**. Thank you very much for inviting me to participate in the hearing today.

Air Midwest has been in business for 16 years. We presently operate under almost every area of air transportation regulations. We operate both with a certificate of public convenience and necessity and under what used to be an exemption from economic regulation, part 298 of the CAB's regulations. We seem to have gotten some additional regulation.

Senator **Kassebaum**. That is an issue for another time.

Mr. **Adamson**. Yes.

Our fleet of 15 is the world's largest Swearingen Metro Fleet. Over the years we have operated Cessna 402's and Beech 99's also. We presently serve 33 airports in 8 States and before the controllers' walkout we carried between 25,000 and 30,000 passengers per month. It looks like the last couple of days it is pretty much back to normal as far as our boardings are concerned, so we are happy about that. We hope to carry our millionth passenger in November of this year.

Although the Swearingen Metro II has been a leader of the 12,500-pound class of commuter aircraft, it still has a way to go in areas of current technology. Fairchild Swearingen has recently taken advantage of a rationalization of FAA aircraft certification requirements and improved the aircraft substantially.

The Metro III is now a very productive, efficient aircraft by today's standards as will be the new Beech 1900. Even though the Twin Otter, Bandeirante, and Jetstream are very visible and, in some cases, have very good financing packages. I feel the U.S. manufacturers are very competitive in this size aircraft. John Zimmerman has given me some copies of turbine engine fleets of the world, a survey I would like to submit, that will reference the total number of turbine aircraft in the world, who operates what.

Mr. **Glickman**. It will be included.

[The information follows:]

Turbine-Engined Fleets of the World's Airlines

1981

Comments

This issue of the Air World Survey marks the beginning of the second quarter-century of its existence. To mark this occasion, the Survey has been expanded to include a class of airline which has come to the fore in recent years — namely, the local service, better known as the commuter airline. This has meant the addition of 178 airlines, bringing the total to 621 compared with 443 in last year's Survey. While most of this increase represents the inclusion of the commuter airlines, it is also due in part to deregulation of the airline industry in the United States.

Several new aircraft have been launched in the past year for commuter lines, with orders announced for the British Aerospace BAe 146, the Embraer EMB-120 Brasilia, the Saab-Fairchild 340, the Shorts 360 and Swearingen SA-227 Metro III. In the major air carrier field, Boeing has announced the go-ahead for the Model 737-300 and initial orders have been placed.

Regarding aircraft on order, the Boeing 767 appears to be the leader with 186 units committed. It is followed by 178 orders for the Boeing 737, 128 units of the Boeing 757, 113 units of the 727, 98 orders for the Airbus Industries A300, 98 orders for the McDonnell-Douglas DC-9, and 85 orders for the Airbus A310. Offsetting the introduction of the newer generation of turbine-engined aircraft is the retirement of the de Havilland Comet, the first commercial jet airliner, thirty-one years after it first flew in 1949. Many of its Boeing and Douglas contemporaries have been withdrawn from use during the past year due to their high operating costs.

With a count of 8,726 turbine-powered aircraft in service by the world's airlines and 1,297 aircraft on order, a total of 10,023 aircraft are counted. Because commuter airlines have been added to the Survey, direct comparisons with last year's Summary of aircraft in service and on order are not too meaningful. The Boeing 727 still leads the fleet with 1,585 aircraft in service, followed by the DC-9 with 882 aircraft and then the Boeing 737 with 708 units in service. Of the turboprop-powered aircraft, the field is led by the de Havilland of Canada DHC-6 Twin Otter with 456 aircraft in service, followed by the Fokker/Fairchild F-27/FH-227 with 402 aircraft.

A glossary of the abbreviations used in the Survey has been provided on page 35 this year for convenience.

It should be noted that, while the figures on aircraft in service have been projected to 30 June 1981, the numbers on order are based on those announced to 31 March. The report indicates used aircraft on order by placing the number of aircraft in parentheses. These used aircraft on order are not included in the Summary.

* * * * *

This survey has been compiled by Aviation Data Service, Inc. (AvData) Wichita, Kansas. Every effort has been made to insure accuracy of the information published in this survey, but complete accuracy cannot be guaranteed. Most airlines cooperated readily by supplying fleet and powerplant details when approached, details for the airlines who were unable to respond have been taken from AvData records.

AIR WORLD
SURVEY

Supplement to Volume 33 Number 2, 1981

SUMMARY

The following table shows, by types, the turbine-powered airliners in service with the world's airlines (excluding Aeroflot, the USSR national airline) on June 30, 1981, and those on order as of March 31, 1981. Details of aircraft on option are given in the main body of the Survey.

TURBOJET-POWERED AIRCRAFT	IN SERVICE	ON ORDER	TOTAL BY TYPES
Aerospatiale SE-210 Caravelle	119	—	119
Aerospatiale SN-601 Corvette	11	—	11
Airbus Industries A300	132	98	230
Airbus Industries A310	—	85	85
BAe/Aerospatiale Concorde	14	—	14
BAe 146	—	3	3
BAe One-Eleven	159	2	161
BAe Trident	86	—	86
BAe HS-125	6	—	6
BAe VC-10	1	—	1
Boeing 707	471	—	471
Boeing 720	76	—	76
Boeing 727	1585	113	1698
Boeing 737	708	178	886
Boeing 747	478	81	559
Boeing 757	—	128	128
Boeing 767	—	186	186
Cessna 500/550 Citation I/II	37	—	37
Convair 990	12	—	12
Dassault-Falcon 10/20	45	—	45
Dassault Mercure	10	—	10
Douglas DC-8	358	—	358
Douglas DC-9	882	98	980
Douglas DC-10	338	15	353
Fokker F-28 Fellowship	128	12	140
Gates Learjet	35	1	36
Grumman G-1159 Gulfstream II/III	12	1	13
Ilyushin Il-62	39	—	39
Ilyushin Il-76	2	—	2
Israel Aircraft Industries 1121/1124	5	—	5
Lockheed L-1011 Tristar	192	40	232
Lockheed L-1329 Jetstar	4	—	4
MBB HFB-320 Hansa Jet	5	—	5
Tupolev Tu-134	68	—	68
Tupolev Tu-154	31	—	31
VFW-Fokker VFW-614	5	—	5
Yakovlev Yak-40/42	31	2	33
Total	6085	1043	7128

TURBOPROP-POWERED AIRCRAFT	IN SERVICE	ON ORDER	TOTAL BY TYPES
Aerospatiale (Nord) 262/Mohawk 298	29	—	29
Antonov An-12	3	—	3
Antonov An-24/26	96	—	96
BAe Vanguard	8	—	8
BAe Viscount	77	—	77
BAe HP-137 Jetstream	17	—	17
BAe HS-748	144	7	151
Beech 90 King Air	16	—	16
Beech 99 Airliner	123	10	133
Beech 200 King Air	20	—	20
Bristol 175 Britannia	12	—	12
Canadair CL-44	10	—	10
CASA/Nurtanio C-212	34	46	80
Cessna 425 Corsair	—	1	1
Cessna 441 Conquest	2	2	4
Convair 580/600/640	147	—	147
DH Canada DHC-2 Mk.III Turbo Beaver	8	—	8
DH Canada DHC-5E Transporter	—	2	2
DH Canada DHC-6 Twin Otter	456	17	473
DH Canada DHC-7 Dash 7	38	23	61
DH Canada DHC-8 Dash 8	—	17	17
Embraer EMB-110 Bandeirante	157	13	170
Embraer EMB-120 Brasilia	—	10	10
Fokker/Fairchild F-27/FH-227 Friendship	402	18	420
Government Aircraft Factories Nomad	34	1	35
Grumman G-21C Turbo Goose	2	—	2
Grumman G-73 Trubo Mallard	1	—	1
Grumman G-159 Gulfstream I	16	—	16
Handley Page Herald	31	—	31
Hawker-Siddeley Argosy	5	—	5
Ilyushin Il-18	61	—	61
LET L-410	11	—	11
Lockheed L-188 Electra	96	—	96
Lockheed L-382 Hercules	48	1	49
Mitsubishi MU-2B	13	—	13
Nihon Airplane Manufacturing Co. YS-11	117	—	117
Pilatus PC-6 Turbo Porter	5	—	5
Piper PA-31T Cheyenne I	5	—	5
Piper PA-42T Cheyenne III	1	—	1
Rockwell 680/690 Turbo Commander	12	—	12
Saab-Fairchild 340	—	20	20
Saunders ST-27	5	—	5
Shorts SC-7 Skyvan/Skyliner	29	—	29
Shorts 330	63	4	67
Shorts 360	—	10	10
Swearingen SA-226T/AT Merlin	6	—	6
Swearingen SA-226TC Metro	143	12	155
Transall C-160	5	—	5
Total	2508	214	2722

TURBINE-POWERED HELICOPTERS *(Air Carrier Operated)*	IN SERVICE	ON ORDER	TOTAL BY TYPES
Aerospatiale SA-315 Lama	2	—	2
Aerospatiale SA-318 Alouette II	7	—	7
Aerospatiale SA-330 Puma	3	—	3
Aerospatiale AS-332 Super Puma	1	—	1
Aerospatiale SA-341 Gazelle	1	—	1
Aerospatiale AS-355 Twinstar	—	1	1
Aerospatiale SA-360 Dauphin	7	—	7
Bell 204	4	—	4
Bell 206	7	—	7
Bell 212	5	—	5
Bell (Fuji) 214	3	—	3
Boeing-Vertol 234 Chinook	1	7	8
Hughes (Kawasaki) 500	24	—	24
MBB Bo 105	11	30	41
Sikorsky S-55T	3	—	3
Sikorsky S-58T	9	—	9
Sikorsky S-61	34	—	34
Sikorsky S-62	1	—	1
Sikorsky S-64	1	—	1
Sikorsky S-76	9	—	9
Westland WG30	—	2	2
Total	133	40	173
Grand Totals:	8726	1297	10,023

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
ACES — see **Aerolineas Centrales de Colombia**					
Aeral (Italy)	Douglas DC-8-54F	4x P&W JT3D-3B	1	—	
Aer Lingus (Ireland)	BAe One-Eleven Srs 208AL	2x RR Spey 506-14	4	—	
	Boeing 707-348C	4x P&W JT3D-3B	2	—	
	Boeing 737-248	2x P&W JT8D-9A	4	—	
	Boeing 737-281	2x P&W JT8D-9A	2	(1)	On order from Guiness-Peat
	Boeing 737-248 Advanced	2x P&W JT8D-9A	2	(1)	On order from Guiness-Peat
	Boeing 737-248C	2x P&W JT8D-9A	3	—	
	Boeing 737-248C Advanced	2x P&W JT8D-9A	1	—	
	Boeing 747-130	4x P&W JT9D-7	1	—	Leased
	Boeing 747-148	4x P&W JT9D-3A	2	—	
Aeroamerica (USA)	Boeing 707-138B	4x P&W JT3D-1	1	—	
	Boeing 707-227	4x P&W JT4A-3	1	—	Leased
	Boeing 707-321	4x P&W JT4A-12	1	—	Leased
	Boeing 707-331	4x P&W JT4A-12	1	—	
	Boeing 720-022	4x P&W JT3C-7	1	—	
	Boeing 720-027	4x P&W JT3C-7	3	—	Two leased
	Boeing 720-048	4x P&W JT3C-7	1	—	
	Boeing 720-062	4x P&W JT3C-7	1	—	
Aerocaribe — **Aerovias Caribe** (Mexico)	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	
Aerochaco — see **Lineas Aereas Chaquenas**					
Aerocondor — see **Aerovias Condor de Colombia**					
Aero Contractors of Nigeria (Nigeria)	BAe HS-125 Series 1B	2x RR Viper 522	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	4	—	
Aerocor — see **Aerolineas Cordillera**					
Aerogulf Services (United Arab Emirates)	Boeing 707-338C	4x P&W JT3D-3B	1	—	
	Boeing 747-286B Combi	4x P&W JT9D-7F	1	—	
Aerolineas Argentinas (Argentina)	Boeing 707-387B	4x P&W JT3D-3B	4	—	
	Boeing 707-372C	4x P&W JT3D-3B	2	—	
	Boeing 707-387C	4x P&W JT3D-7	2	—	
	Boeing 727-2M7 Advanced	3x P&W JT8D-17R	1	—	Leased
	Boeing 727-287 Advanced	3x P&W JT8D-17	3	4	
	Boeing 737-287	2x P&W JT8D-9	4	—	
	Boeing 737-287 Advanced	2x P&W JT8D-9	6	—	
	Boeing 737-287C	2x P&W JT8D-9	2	—	
	Boeing 747-287B	4x P&W JT9D-7Q	5	2	
	Boeing 747SP-27	4x P&W JT9D-7FW	2	—	
	Fokker F-28-1000	2x RR Spey 555-15	3	—	
	Fokker F-28-4000	2x RR Spey 555-15H	1	—	
Aerolineas Centrales de Colombia — **ACES** (Colombia)	Boeing 727-025	3x P&W JT8D-1	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	10	4	
Aerolineas Colonia — **ARCO** (Uruguay)	Convair 600	2x RR Dart 532-4	1	—	
Aerolineas Condor (Ecuador)	BAe Viscount 745D	4x RR Dart 510-6	1	—	
	Fairchild F-27F	2x RR Dart 528-7E	1	—	
	Fairchild F-27J	2x RR Dart 532-7	1	—	
Aerolineas Cordillera — **Aerocor** (Chile)	Govt Acft Factories N-22B	2x Asn 250-B17B	1	—	
Aerolineas Nacionales del Ecuador — **ANDES** (Ecuador)	Canadair CL-44-6	4x RR Tyne 515-12	2	—	
	Douglas DC-8-32F	4x P&W JT4A-3	1	—	
	Douglas DC-8-55F	4x P&W JT3D-3B	1	—	
Aerolinee Itavia (Italy)	Douglas DC-9-11	2x P&W JT8D-7	3	—	
	Douglas DC-9-15	2x P&W JT8D-7	6	—	
	Douglas DC-9-21	2x P&W JT8D-11	1	—	Leased
	Douglas DC-9-32F	2x P&W JT8D-7	1	—	Leased
	Douglas DC-9-33CF	2x P&W JT8D-7	2	—	Leased
	Fokker F-28-1000	2x RR Spey 555-15	3	—	
Aero Lloyd Flugreisen (West Germany)	Aerospatiale Caravelle 10R	2x P&W JT8D-7	3	—	One leased
Aeromech (USA)	Beech 99A	2x P&WC PT6A-27	3	—	
	Beech B99	2x P&WC PT6A-27	2	—	
	Embraer EMB-110P1	2x P&WC PT6A-34	3	6	
	Embraer EMB-110P2	2x P&WC PT6A-34	2	—	
	Embraer EMB-120	2x P&WC PW102A	—	6	
Aeronaves del Centro (Venezuela)	Shorts 330	2x P&WC PT6A-45	3	—	
Aeronaves del Peru (Peru)	Canadair CL-44-6	4x RR Tyne 515-12	1	—	
	Douglas DC-8-43F	4x RR Conway 509	1	—	
	Douglas DC-8-55F	4x P&W JT3D-3B	1	—	
Aeronaves de Mexico — **Aeromexico** (Mexico)	Douglas DC-8-51	4x P&W JT3D-3B	6	—	One leased
	Douglas DC-9-15	2x P&W JT8D-7A	10	—	Two leased
	Douglas DC-9-32	2x P&W JT8D-17	17	2	Four leased
	Douglas DC-9-82	2x P&W JT8D-217	—	4	
	Douglas DC-10-15	3x GE CF6-50C2F	—	2	
	Douglas DC-10-30	3x GE CF6-50C	2	—	
Aeronor Chile — **Aero Norte-Sur** (Chile)	Fairchild F-27A	2x RR Dart 528-7E	2	—	
	Fairchild F-27J	2x RR Dart 532-7	3	—	
Aeropelican Intercity Commuter (Australia)	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	
Aeroperlas (Panama)	DH Canada DHC-6-300	2x P&WC PT6A-27	4	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Aeroperu — Empresa de Transporte Aereo del Peru (Peru)	Boeing 727-125	3x P&W JT8D-7	1	—	
	Boeing 727-130C	3x P&W JT8D-7	1	—	
	Fokker F-27-600	2x RR Dart 532-7	2	—	
	Fokker F-28-1000	2x RR Spey 555-15	3	—	
	Lockheed L-1011-1	3x RR RB.211-22B	2	2	
Aeropesca Colombia (Colombia)	BAe Viscount 745D	4x RR Dart 510-6	3	—	
	BAe Viscount 798D	4x RR Dart 510-6	1	—	
Aerotal — Taxi Aero El Llanero (Colombia)	Aerospatiale Caravelle VIR	2x [illegible] Avon 533R	6	—	
	Boeing 707-331C	4x P&W JT3D-3B	1	—	Leased
	Boeing 727-121	3x P&W JT8D-7A	2	—	
Aero Trasporti Italiane — ATI (Italy)	Douglas DC-9-32	2x P&W JT8D-9	21	—	
	Fokker F-27-200	2x RR Dart 528-7E	1	—	
	Fokker F-27-600	2x RR Dart 528-7E	4	—	
Aero Uruguay (Uruguay)	Boeing 707-331C	4x P&W JT3D-3B	1	—	Leased
Aerovias Colombianas — ARCA (Colombia)	Douglas DC-8-43F	4x RR Conway 509	2	—	
	Douglas DC-8-51	4x P&W JT3D-1	2	—	One leased
Aerovias Condor de Colombia — Aerocondor (Colombia)	Boeing 707-123B	4x P&W JT3D-1-MC7	2	—	
	Boeing 707-123B(F)	4x P&W JT3D-1-MC7	1	—	
	Boeing 720-023B	4x P&W JT3D-1	1	—	
	Douglas DC-8-33F	4x P&W JT3D-3B	1	—	Leased
	Lockheed L-188A	4x Asn 501 D13	2	—	
	Lockheed L-188C(F)	4x Asn 501-D13	1	—	
Aerovias del Cesar — TAC (Colombia)	Aerospatiale Caravelle VIR	2x RR Avon 533R	4	—	Two leased
	BAe Viscount 828	4x RR Dart 525-7	1	—	
	BAe Viscount 837	4x RR Dart 525-7	1	—	
Aerovias Nacionales de Colombia — AVIANCA (Colombia)	Boeing 707-321B	4x P&W JT3D-3B	3	—	
	Boeing 707-359B	4x P&W JT3D-3B	2	—	
	Boeing 707-321C	4x P&W JT3D-3B	3	—	One leased
	Boeing 720-030B	4x P&W JT3D-3	1	—	
	Boeing 720-059B	4x P&W JT3D-1	2	—	
	Boeing 727-121	3x P&W JT8D-1	4	—	
	Boeing 727-146	3x P&W JT8D-7	3	—	Leased
	Boeing 727-159	3x P&W JT8D-1	4	—	
	Boeing 727-124C	3x P&W JT8D-9	2	—	
	Boeing 727-2A1 Advanced	3x P&W JT8D-17	2	—	
	Boeing 727-2Q9 Advanced	3x P&W JT8D-15	2	—	Leased
	Boeing 727-259 Advanced	3x P&W JT8D-17R	—	3	
	Boeing 747-124	4x P&W JT9D-7AH	1	—	
	Boeing 747-259B Combi	4x P&W JT9D-7A	1	—	
	Boeing 767-259	2x P&W JT9D-7R4D	—	3	Plus four options
Aerovias Nacionales de Honduras — ANHSA (Honduras)	DH Canada DHC-7-102	4x P&WC PT6A-50	1	—	
Aerovias Venezolanas — AVENSA (Venezuela)	Boeing 727-227	3x P&W JT8D-17R	1	—	
	Boeing 727-294 Advanced	3x P&W JT8D-17	2	—	
	Convair 580	2x Asn 501-D13D	2	—	
	Douglas DC-9-14	2x P&W JT8D-7	2	—	
	Douglas DC-9-32	2x P&W JT8D-7	6	—	
Aer Turas (Ireland)	Bristol 175 Britannia 253F	4x Br Proteus 255	1	—	
	Canadair CL-44J	4x RR Tyne 515-10	1	—	
Affretair (Zimbabwe)	Canadair CL-44D4-2	4x RR Tyne 515-12	1	—	
	Douglas DC-8-55F	4x P&W JT3D-3B	2	—	
Afrek (UK)	Bristol 175 Britannia 253	4x Br Proteus 765	2	—	
African Safari Airways (Kenya)	Douglas DC-8-53	4x P&W JT3D-3B	1	—	
Air Affaires (France)	Aerospatiale SA-330J	2x Tbm Turmo IVC	1	—	
	Aerospatiale SA-341G	1x Tbm Astazou IIIA	1	—	
	BAe HS-125 Series 3B	2x RR Viper 522	1	—	Leased
	Beech 200	2x P&WC PT6A-41	1	—	
	Bell 206A	1x Asn 250-C18	1	—	Leased
	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	
	Gates Learjet 24	2x GE CJ610-4	1	—	
Air Affaires Gabon (Gabon)	Beech E90	2x P&WC PT6A-28	1	—	
	Beech 200	2x P&WC PT6A-41	1	—	
	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	
	Gates Learjet 35A	2x AiR TFE731-2-2B	1	—	
	Transall C-160G	2x RR Tyne 515-22	1	—	
Air Afrique (Ivory Coast)	Aerospatiale Caravelle 11R	2x P&W JT8D-7R	2	—	
	Airbus A300B4-103	2x GE CF6-50C2	—	1	
	Airbus A310-200	2x undecided	—	2	
	Boeing 747-2S4F	4x P&W JT9D-7Q	1	—	
	Douglas DC-8-53	4x P&W JT3D-3B	3	—	
	Douglas DC-8-55F	4x P&W JT3D-3B	2	—	
	Douglas DC-8-63F	4x P&W JT3C-7	1	—	
	Douglas DC-10-30	3x GE CF6-50C	3	—	
Air Alexandrie (Egypt)	Aerospatiale Caravelle III	2x RR Avon 527	2	—	Leased
Air Algerie — Ste Nationale de Transport et de Travail Aeriens (Algeria)	Boeing 727-2D6	3x P&W JT8D-9	2	—	
	Boeing 727-2D6 Advanced	3x P&W JT8D-15	6	2	
	Boeing 737-2D6 Advanced	2x P&W JT8D-15	10	—	
	Boeing 737-2D6C Advanced	2x P&W JT8D-9	3	—	
	Douglas DC-8-63F	4x P&W JT3D-7	1	—	Leased
	Handley Page Herald 214	2x RR Dart 527-7	1	—	Leased
	Handley Page Herald 401	2x RR Dart 527-7	3	—	Leased
	Lockheed L-382G	4x Asn 501-D22A	1	—	Leased

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Air Alpes (France)	Beech 99	2x P&WC PT6A-20	2	—	Leased
	Beech 99A	2x P&WC PT6A-27	3	—	One leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	Leased
	Fokker F-27-400	2x RR Dart 532-7	2	—	Leased
	Fokker F-27-600	2x RR Dart 532-7	2	—	Leased
	Fokker F-28-1000	2x RR Spey 555-15	1	—	Leased
Air Alsace (France)	Aerospatiale Corvette 100	2x P&WC JT15D-4	2	—	Leased
	Fokker F-27-100	2x RR Dart 514-7	1	—	Leased
	Fokker F-27-200	2x RR Dart 532-7	2	—	One leased
	Fokker F-28-1000	2x RR Spey 555-15	1	—	Leased
	Fokker F-28-4000	2x RR Spey 555-15H	2	—	Leased
	VFW-Fokker VFW-614	2x R/S M45H Mk. 501	3	—	One leased
Air Anjou Transports (France)	Beech 99	2x P&WC PT6A-20	2	—	Leased
Air Atonabee (Canada)	Saunders ST-27	2x P&WC PT6A-34	4	—	
Air Bahama (Bahamas)	Douglas DC-8-63F	4x P&W JT3D-7	1	—	Leased
Air Balear (Israel)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	1	—	
Air BC (Canada)	DH Canada DHC-6-100	2x P&WC PT6A-20	8	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	6	—	
	Grumman G-21C	2x P&WC PT6A-20	2	—	
	Grumman G-73	2x P&WC PT6A-27	1	—	
Air Belgium (Belgium)	Boeing 707-351C	4x P&W JT3D-3B	1	—	
	Boeing 737-2P6 Advanced	2x P&W JT8D-15	1	—	Leased
	Boeing 737-200 Advanced	2x P&W JT8D-9A	—	1	
Air Benin (Benin)	Aerospatiale Corvette 100	2x P&WC JT15D-4	1	—	
	Fokker F-27-600	2x RR Dart 532-7R	2	—	
Air Berlin USA (Germany)	Boeing 707-331B	4x P&W JT3D-3B	1	—	Leased
	Boeing 737-214	2x P&W JT8D-9	1	—	Leased
Airborne Express (USA)	Aerospatiale Caravelle VIR	2x RR Avon 533R	5	—	Two leased
	Aerospatiale Corvette 100	2x P&WC JT15D-4	1	—	
	Cessna 500 Citation I	2x P&WC JT15D-1	6	—	Five leased
	Convair 600	2x RR Dart 542-4	2	—	Leased
	Douglas DC-9-32	2x P&W JT8D-7A	1	—	Leased
	Gates Learjet 23	2x GE CJ610-4	3	—	Two leased
	MBB HFB-320 Hansa Jet	2x GE CJ610-9	5	—	Two leased
	NAMC YS-11A-200	2x RR Dart 542-10K	1	—	
	NAMC YS-11A-500	2x RR Dart 542-10K	6	—	Four leased
Air Botswana (Botswana)	BAe HS-748 Series 2A	2x RR Dart 532-2L	1	—	
	BAe Viscount 761D	4x RR Dart 510	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	Lockheed L-382G	4x Asn 501-D22A	2	—	Leased
Air Bridge Carriers (UK)	BAe Vanguard 953C	4x RR Tyne 506	3	—	One leased
	Hawker-Siddeley Argosy 650	4x RR Dart 532-1	3	—	One leased
Air Burundi (Burundi)	Aerospatiale Caravelle III	2x RR Avon 527	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Air Caledonie (New Caledonia)	Aerospatiale SA-318C	1x Tbm Astazou IIA	1	—	Leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	
Air California — Aircal (USA)	Boeing 737-159	2x P&W JT8D-7	2	—	Leased
	Boeing 737-2H4	2x P&W JT8D-7	1	—	Leased
	Boeing 737-222	2x P&W JT8D-7A	3	—	Leased
	Boeing 737-247	2x P&W JT8D-9	2	—	
	Boeing 737-293	2x P&W JT8D-7	8	—	Six leased
	Douglas DC-9-81	2x P&W JT8D-209	—	6	
Air Canada (Canada)	Boeing 727-233 Advanced	3x P&W JT8D-15	36	3	
	Boeing 747-133	4x P&W JT9D-3	5	—	
	Boeing 747-233B Combi	4x P&W JT9D-7	2	—	
	Boeing 767-233	2x P&W JT9D-7R4D	—	12	Plus 18 options
	Douglas DC-8-54F	4x P&W JT3D-3B	6	—	
	Douglas DC-8-61	4x P&W JT3D-3B	7	—	
	Douglas DC-8-63	4x P&W JT3D-7	12	—	
	Douglas DC-9-32	2x P&W JT8D-7	41	—	
	Lockheed L-1011-1	3x RR RB.211-22B	6	2	
	Lockheed L-1011-100	3x RR RB.211-22B	4	—	
	Lockheed L-1011-500	3x RR RB.211-524B	—	6	
Air Cape (South Africa)	BAe HS-748 Series 2A	2x RR Dart 535-2	1	—	
	Convair 580	2x Asn 501-D13D	1	—	
Air Cargo Egypt (Egypt)	Boeing 707-338C	4x P&W JT3D-3B	1	—	
Air Charter International (France)	Aerospatiale Caravelle III	2x RR Avon 527	4	—	
	Boeing 727-214	3x P&W JT8D-7	2	—	Leased
Air-Dale (Canada)	DH Canada DHC-6-300	2x P&WC PT6A-27	4	—	Leased from norOntair
Air Djibouti — Red Sea Airlines (Djibouti)	Boeing 737-2K2C Advanced	2x P&W JT8D-15	1	—	Leased
	DH Canada DHC-6-200	2x P&WC PT6A-20	2	—	
Air Ecosse/Fairflight (UK)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
	Embraer EMB-110P1	2x P&WC PT6A-34	3	—	
	Embraer EMB-110P2	2x P&WC PT6A-34	6	—	
	Rockwell Commander 690B	2x AiR TPE331-5-251	1	—	
Aires (Colombia)	Embraer EMB-110P1	2x P&WC PT6A-34	2	—	
Air Europe (UK)	Boeing 737-2S3 Advanced	2x P&W JT8D-15	4	2	Three leased
Airfast Services Indonesia (Indonesia)	BAe HS-748 Series 2A	2x RR Dart 532-2L	1	—	
	Sikorsky S-58DT	1x P&WC PT6T-6 Twin-Pac	1	—	
	Sikorsky S-58ET	1x P&WC PT6T-6 Twin-Pac	1	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Air Fleets International (USA)	Douglas DC-8-33	4x P&W JT4A-11	1	—	Leased
Air Florida (USA)	Boeing 737-112	2x P&W JT8D-9	4	—	
	Boeing 737-222	2x P&W JT8D-7A	7	—	Two leased
	Boeing 737-2Q9 Advanced	2x P&W JT8D-15	1	—	
	Boeing 737-2T4 Advanced	2x P&W JT8D-15	7	5	Orders have -17 engines
	Douglas DC-9-15F	2x P&W JT8D-7	5	—	
	Douglas DC-10-30CF	3x GE CF6-50C2	3	—	Leased, one with -50C1 engines
Air Foyal (French Antilles)	Aerospatiale Corvette 100	2x P&WC JT15D-4	1	—	
Air France (France)	Aero/BAe Concorde	4x R/S Olympus 593	7	—	Three leased
	Airbus A300B2-101	2x GE CF6-50C	9	—	Two leased
	Airbus A300B4-201	2x GE CF6-50C	4	—	
	Airbus A300B4-203	2x GE CF6-50C2	7	3	Twelve options
	Airbus A310-202	2x GE CF6-80A1	—	5	Ten options
	Boeing 707-328B	4x P&W JT3D-3B	7	—	
	Boeing 707-328C	4x P&W JT3D-3B	6	—	
	Boeing 707-355C	4x P&W JT3D-3B	1	—	
	Boeing 707-321C(F)	4x P&W JT3D-3B	3	—	
	Boeing 727-228	3x P&W JT8D-7	20	—	
	Boeing 727-228 Advanced	3x P&W JT8D-15	8	11	Four leased
	Boeing 747-128	4x P&W JT9D-7	15	—	Six leased
	Boeing 747-228B	4x GE CF6-50E	1	6	
	Boeing 747-228B Combi	4x GE CF6-50E	8	—	Four leased
	Boeing 747-228F	4x GE CF6-50E	3	5	
	Boeing 747-228F	4x P&W JT9D-7	1	—	Leased
	Fokker F-27-500	2x RR Dart 532-7	15	—	Operated on lease for Postal Service
	Transall C-160F	2x RR Tyne 22	4	—	
Air Fret (France)	Boeing 707-131(F)	4x P&W JT3D-3	1	—	Leased
Air Gabon (Gabon)	BAe Vanguard 953C	4x RR Tyne 506	1	—	
	Boeing 727-2Q2 Advanced	3x P&W JT8D-17	—	1	
	Boeing 737-2Q2C Advanced	2x P&W JT8D-17	1	—	
	Boeing 747-2Q2B Combi	4x GE CF6-50E	1	—	
	Fokker F-28-1000	2x RR Spey 555-15	1	—	
	Fokker F-28-2000	2x RR Spey 555-15	3	—	
Airgava (Canada)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	2	—	
Air Glaciers (Switzerland)	Pilatus PC-6/B1-H2	1x P&WC PT6A-20	1	—	
	Pilatus PC-6/B2-H2	1x P&WC PT6A-27	2	—	
Air Great Lakes (Australia)	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	Leased
Air Guadeloupe — Ste Antillaise de Transports Aeriens (Guadeloupe)	DH Canada DHC-6-300	2x P&WC PT6A-27	4	—	
	Fairchild F-27J	2x RR Dart 532-7	2	—	
Air Guinea (Guinea)	Antonov An-12B	4x Ivc AI-20	1	—	
	Boeing 727-127C	3x P&W JT8D-7A	1	—	
	Ilyushin Il-18D	4x Ivc AI-20M	2	—	
	Ilyushin Il-18V	4x Ivc AI-20K	1	—	
Air Haiti (Haiti)	Boeing 707-331C	4x P&W JT3D-3B	1	—	Leased
Air Illinois (USA)	BAe HP-137 Jetstream	2x P&WC PT6A-34	2	—	Leased
	BAe HS-748 Series 2A	2x RR Dart 532-2L	1	—	Leased
	BAe HS-748 Series 2B	2x RR Dart 536-2	1	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	Leased
Air India (India)	Boeing 707-337B	4x P&W JT3D-3B	3	—	
	Boeing 707-337C	4x P&W JT3D-3B	2	—	
	Boeing 707-437	4x RR Conway 508	2	—	
	Boeing 747-237B	4x P&W JT9D-7	10	—	Four with -7Q engines
	Douglas DC-8-63F	4x P&W JT3D-7	1	—	Leased
Air Inter — Lignes Aeriennes Interieures (France)	Aerospatiale Caravelle III	2x RR Avon 527	16	—	
	Aerospatiale Caravelle 12	2x P&W JT8D-9R	6	—	Five leased
	Airbus A300B2-101	2x GE CF6-50C	7	—	
	Dassault Mercure 100C	2x P&W JT8D-15	10	—	
	Fokker F-27-100	2x RR Dart 514-7	1	—	Leased
	Fokker F-27-500	2x RR Dart 532-7R	9	—	
Air Inter Gabon (Gabon)	Aerospatiale Corvette 100	2x P&WC JT15D-4	1	—	
	Cessna 550 Citation II	2x P&WC JT15D-4	1	—	Leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	—	2	
Air Inuit (Canada)	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Air Ivoire (Ivory Coast)	Fokker F-27-400	2x RR Dart 532-7	1	—	
	Fokker F-27-600	2x RR Dart 532-7R	2	—	
	Fokker F-28-1000	2x RR Spey 555-15	1	—	
	Fokker F-28-4000	2x RR Spey 555-15H	2	—	
Air Jamaica (Jamaica)	Boeing 727-2J0 Advanced	3x P&W JT8D-15	4	—	
	Douglas DC-8-51	4x P&W JT3D-3B	3	—	
	Douglas DC-8-61	4x P&W JT3D-3B	2	—	
	Douglas DC-8-62	4x P&W JT3D-7	1	—	
	Douglas DC-9-32	2x P&W JT8D-7	2	—	
Air Kentucky (USA)	Beech 99A	2x P&WC PT6A-27	2	—	One leased
	Beech B99	2x P&WC PT6A-27	1	—	Leased
Air Lanka (Sri Lanka)	Boeing 707-312B	4x P&W JT3D-3B	2	—	
	Boeing 737-2M6 Advanced	2x P&W JT8D-15	1	—	Leased
	Lockheed L-1011-1	3x RR RB.211-22B	1	—	Leased
	Lockheed L-1011-500	3x RR RB.211-524B4	—	2	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Airliban — see **Middle East Airlines**					
Air Liberia (Liberia)	BAe HS-748 Series 2A	2x RR Dart 532-2	1	—	
	Boeing 737-2Q5C Advanced	2x P&W JT8D-7	1	—	
Airlift International (USA)	Douglas DC-8-33F	4x P&W JT4A-9	2	—	
	Douglas DC-8-54F	4x P&W JT3D-3B	3	—	Leased
	Douglas DC-8-63F	4x P&W JT3D-7	3	—	Two leased
Air Limousin (France)	Beech 99	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
Air Littoral (France)	Embraer EMB-110P2	2x P&WC PT6A-34	3	—	
Air Madagascar — Ste Nationale Malgache de Transports Aeriens (Malagacy)	BAe HS-748 Series 2A	2x RR Dart 536-2	2	—	
	Boeing 737-2B2	2x P&W JT8D-9	1	—	
	Boeing 737-2B2 Advanced	2x P&W JT8D-15	1	—	
	Boeing 747-2B2B Combi	4x P&W JT9D-70A	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	6	—	
Air Malawi (Malawi)	BAe One-Eleven Srs 481FW	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 524FF	2x RR Spey 512-14DW	1	—	Leased
	BAe HS-748 Series 2A	2x RR Dart 534-2	2	—	
	Beech C90	2x P&WC PT6A-21	1	—	
	Shorts SC-7 Skyvan Srs 3	2x AiR TPE331-201	3	—	
Air Mali (Mali)	Aerospatiale Caravelle 10B	2x P&W JT8D-1	1	—	
	Antonov An-24V	2x Ivc AI-24A	1	—	
	Boeing 727-173C	3x P&W JT8D-7	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
	Ilyushin Il-18D	4x Ivc AI-20M	1	—	
Air Malta (Malta)	Boeing 720-040B	4x P&W JT3D-3B	2	—	
	Boeing 720-047B	4x P&W JT3D-3B	3	—	
	Boeing 737-2K2 Advanced	2x P&W JT8D-15	1	—	Leased
	Boeing 737-2K2C Advanced	2x P&W JT8D-15	2	—	Leased
Air Manila (Philippines)	Boeing 707-321	4x P&W JT4A-12	2	—	
	Boeing 707-331	4x P&W JT4A-12	1	—	
	Boeing 707-321B	4x P&W JT3D-3	2	—	
	Fairchild F-27	2x RR Dart 514-7	1	—	
	Handley Page Herald 215	2x RR Dart 527	1	—	
Air Martinique — Ste Antillaise de Transports Aeriens (Martinique)	Aerospatiale Caravelle VIR	2x RR Avon 533R	2	—	
	Fairchild F-27J	2x RR Dart 532-7	2	—	
Air Mauritanie (Mauretania)	Fairchild F-27A	2x RR Dart 528	3	—	
	Fairchild FH-227B	2x RR Dart 532-7	1	—	
Air Mauritius (Mauritius)	Boeing 707-320B	4x P&W JT3D-7	1	—	Leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Air Miami (USA)	CASA C-212-5	2x AiR TPE331-5-251C	1	—	Leased
	CASA C-212-200	2x AiR TPE331-10-501C	2	2	Leased
Air Micronesia (Mariana Islands)	Boeing 727-124C	3x P&W JT8D-7	1	—	Leased
	Boeing 727-192C	3x P&W JT8D-7	1	—	Leased
Air Midwest (USA)	Saab-Fairchild 340	2x GE CT7-5	—	5	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	15	—	Nine leased
Air Mindanao (Philippines)	Fairchild F-27F	2x RR Dart 529-7E	1	—	
Air Mongol — MIAT (Outer Mongolia)	Antonov An-24	2x Ivc AI-24	10	—	
	Antonov An-24V	2x Ivc AI-24A	10	—	
	Antonov An-26	2x Ivc AI-24T	1	—	
Air Nauru (Nauru)	Boeing 727-195	3x P&W JT8D-7	1	—	
	Boeing 727-177C	3x P&W JT8D-7	2	—	
	Boeing 737-2L7 Advanced	2x P&W JT8D-17	1	—	
	Boeing 737-2L7C Advanced	2x P&W JT8D-17	1	—	
Air Nebraska (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	1	1	Leased
Air New England (USA)	Convair 580	2x Asn 501-D13D	1	—	Leased
	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	Leased
	DH Canada DHC-6-200	2x P&WC PT6A-20	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	6	—	
	Fairchild FH-227B	2x RR Dart 532-7	2	—	
	Fairchild FH-227C	2x RR Dart 532-7	4	—	
Air New Zealand (New Zealand)	Boeing 737-214	2x P&W JT8D-7	2	—	
	Boeing 737-219	2x P&W JT8D-7	4	—	
	Boeing 737-222	2x P&W JT8D-7	1	—	
	Boeing 737-219 Advanced	2x P&W JT8D-15	3	1	
	Boeing 747-219B	4x RR RB.211-524C2	3	2	Order has -524D2 engines
	Douglas DC-8-52	4x P&W JT3D-3B	2	—	
	Douglas DC-8-54F	4x P&W JT3D-3B	1	—	
	Douglas DC-10-30	3x GE CF6-50C	6	—	
	Fokker F-27-100	2x RR Dart 514-7	6	—	
	Fokker F-27-500	2x RR Dart 532-7R	2	—	
	Fokker F-27-500F	2x RR Dart 536-7R	6	2	
Air Niger (Niger)	Fokker F-27-600	2x RR Dart 532-7	1	—	
Air Niugini (Niugini)	Boeing 707-338C	4x P&W JT3D-3B	2	—	Leased
	Fokker F-27-200	2x RR Dart 532-7	6	—	
	Fokker F-27-600	2x RR Dart 532-7	1	—	
	Fokker F-28-1000	2x RR Spey 555-15	3	—	
Air North (USA)	Cessna 500 Citation I	2x P&WC JT15D-1	1	—	
	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	One leased
	Grumman G-159 Gulfstream I-C	2x RR Dart 529-8	1	—	
	Shorts 330	2x P&WC PT6A-45B	4	—	Two leased

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Air Ontario (Canada)	Convair 580	2x Asn 501-D13D	5	—	
Air Oregon (USA)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	6	—	One leased
Air Pacific (Fiji)	BAe One-Eleven Srs 413FA	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 479FU	2x RR Spey 512-14DW	2	—	
	Boeing 737-200	2x P&W JT8D-15	1	—	Leased
	Boeing 737-2X2 Advanced	2x P&W JT8D-17	—	1	
	Embraer EMB-110P1	2x P&WC PT6A-34	4	—	
Air Panama Internacional (Panama)	Boeing 727-146	3x P&W JT8D-7B	1	—	Leased
	Boeing 727-181	3x P&W JT8D-7B	2	—	
Air Polynesie (French Polynesia)	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	Fairchild F-27A	2x RR Dart 528-7E	1	—	
	Fairchild F-27J	2x RR Dart 532-7	2	—	
	Fairchild FH-227B	2x RR Dart 532-7	2	—	
Air Portugal — **TAP** (Portugal)	Boeing 707-382B	4x P&W JT3D-3B	7	—	
	Boeing 707-3F5C	4x P&W JT3D-3B	2	—	
	Boeing 707-373C	4x P&W JT3D-3B	1	—	
	Boeing 707-399C	4x P&W JT3D-3B	2	—	
	Boeing 727-182	3x P&W JT8D-7B	4	—	
	Boeing 727-155C	3x P&W JT8D-7B	1	—	Leased
	Boeing 727-172C	3x P&W JT8D-7B	1	—	
	Boeing 727-182C	3x P&W JT8D-7B	2	—	
	Boeing 727-282 Advanced	3x P&W JT8D-17	4	—	
	Boeing 747-282B	4x P&W JT9D-7A	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
	Lockheed L-1011-500	3x RR RB.211-524B	—	1	
Air Rouergue (France)	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	Leased
	Fairchild FH-227B	2x RR Dart 532-7	1	—	
	Fairchild FH-227E	2x RR Dart 532-7L	1	—	
Air Rwanda (Rwanda)	Boeing 707-328C	4x P&W JT3D-3B	1	—	
Air Senegal — **Ste Nationale de Transport Aerien** (Senegal)	BAe HS-748 Series 2A	2x RR Dart 535-2	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Air Service Company (Iran)	Boeing 727-100	3x P&W JT8D-7	2	—	
	Fairchild FH-227B	2x RR Dart 532-7	5	—	
Air Tahiti (Tahiti)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
Air Tanzania (Tanzania)	Boeing 720-022	4x P&W JT3D-1	1	—	Leased
	Boeing 720-051B	4x P&W JT3D-3B	1	—	Leased
	Boeing 737-2R8C Advanced	2x P&W JT8D-15	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	4	—	
	Fokker F-27-200	2x RR Dart 532-7	2	—	
	Fokker F-27-600	2x RR Dart 532-7	3	—	
Air Tasmania (Australia)	Embraer EMB-110P1	2x P&WC PT6A-34	3	—	
	Embraer EMB-120	2x P&WC PW102A	—	2	
Air UK (UK)	BAe One-Eleven Srs 409AY	2x RR Spey 511-14	1	—	
	BAe One-Eleven Srs 416EK	2x RR Spey 511-14	1	—	
	BAe One-Eleven Srs 432FD	2x RR Spey 511-14	2	—	
	Embraer EMB-110P1	2x P&WC PT6A-34	4	—	Leased
	Embraer EMB-110P2	2x P&WC PT6A-34	2	—	Leased
	Fokker F-27-100	2x RR Dart 511-7E	2	—	
	Fokker F-27-200	2x RR Dart 528-7E	11	—	Nine leased
	Fokker F-27-600	2x RR Dart 528-7E	1	—	Leased
	Handley Page Herald 200	2x RR Dart 527-7	14	—	Two leased
	Handley Page Herald 400	2x RR Dart 532-9	1	—	
Air US (USA)	BAe HP-137 Jetstream	2x AiR TPE331-3UW-303G	3	—	
	Grumman G-159 Gulfstream I-C	2x RR Dart 529-8	1	—	
Air Virginia (USA)	BAe HS-748 Series 2B	2x RR Dart 536-2	—	1	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	4	2	Leased
Air Volta (Upper Volta)	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	Embraer EMB-110P2	2x P&WC PT6A-34	1	—	
Air Wisconsin (USA)	DH Canada DHC-7-102	4x P&WC PT6A-50	5	—	
	Swearingen SA226-TC Metro	2x AiR TPE331-3UW-303G	7	—	
	Swearingen SA226-TC Metro II	2x AiR TPE331-3UW-303G	6	—	
Air Zaire (Zaire)	Boeing 737-298C Advanced	2x P&W JT8D-15	3	—	
	Douglas DC-8-33	4x P&W JT4A-12	2	—	
	Douglas DC-8-63F	4x P&W JT3D-7	2	—	
	Douglas DC-10 39	3x GE CF6-50C	2	—	
	Fokker F-27-500	2x RR Dart 536-7R	—	4	
	Fokker F-27-600	2x RR Dart 532-7	4	—	
Air Zimbabwe (Zimbabwe)	BAe Viscount 748D	4x RR Dart 515	3	—	
	BAe Viscount 754D	4x RR Dart 515	2	—	
	BAe Viscount 756D	4x RR Dart 515	1	—	
	BAe Viscount 782D	4x RR Dart 515	1	—	
	BAe Viscount 816	4x RR Dart 530	1	—	
	Boeing 707-330B	4x P&W JT3D-7	3	—	One has -3B engines
	Boeing 707-344C	4x P&W JT3D-7	1	—	
	Boeing 720-025	4x P&W JT3C-7	3	—	
ALA — see **Austral Lineas Aereas**					
ALAS — see **Atlantida Lineo Aerea Sudamericana**					
Alaska Aeronautical Industries (USA)	DH Canada DHC-6-100	2x P&WC PT6A-20	4	—	Three leased
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	

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Alaska Airlines (USA)	Boeing 727-121	3x P&W JT8D-7A	1	—	
	Boeing 727-127	3x P&W JT8D-7A	1	—	
	Boeing 727-190C	3x P&W JT8D-7A	3	—	
	Boeing 727-290 Advanced	3x P&W JT8D-17	2	2	One leased
	Boeing 737-200C	2x P&W JT8D-17	1	—	Leased
	Boeing 737-290C Advanced	2x P&W JT8D-17	—	2	
Alaska Central Airways (USA)	Govt Acft Factories N-24A	2x Asn 250-B17B	1	—	
Alaska International Air (USA)	Boeing 767-200	2x P&W JT9D-7R4D	—	2	
	Lockheed L-382G	4x Asn 501-D22A	5	—	
Alberta Northern Airlines (Canada)	Aero Commander 1121	2x GE CJ610-1	1	—	
	Cessna 500 Citation I	2x P&WC JT15D-1A	1	—	
ALIA — see **Royal Jordanian Airlines**					
Alisarda (Italy)	Douglas DC-9-14	2x P&W JT8D-7	2	—	
	Douglas DC-9-32	2x P&W JT8D-7	2	—	Leased
Alitalia — see **Linee Aeree Italiane**					
All Nippon Airways (Japan)	Boeing 727-281	3x P&W JT8D-9A	16	—	
	Boeing 727-281 Advanced	3x P&W JT8D-17	6	—	
	Boeing 737-281	2x P&W JT8D-9A	6	—	
	Boeing 737-281 Advanced	2x P&W JT8D-17	9	—	
	Boeing 747SR-81	4x GE CF6-45A2	9	8	
	Boeing 767-281	2x GE CF6-80A	—	25	Plus 15 options
	Lockheed L-1011-1	3x RR RB 211-22B	21	—	
	NAMC YS-11-100	2x RR Dart 543-10	4	—	Three leased
	NAMC YS-11A-500	2x RR Dart 543-10K	22	—	One leased
	NAMC YS-11A-600	2x RR Dart 543-10K	2	—	
ALM — see **Antillaanse Luchtvaart Maatschappij**					
Aloha Airlines (USA)	Boeing 737-297	2x P&W JT8D-9	3	—	Leased
	Boeing 737-284 Advanced	2x P&W JT8D-9	2	—	
	Boeing 737-297 Advanced	2x P&W JT8D-9	4	3	
Altair Airlines (USA)	Aerospatiale (Nord) 262A	2x Tbm Bastan VIC	7	—	
	Beech 99	2x P&WC PT6A-20	3	—	
	Beech 99A	2x P&WC PT6A-27	2	—	Leased
	Fokker F-28-4000	2x RR Spey 555-15H	6	3	
Alyemda — see **Democratic Yemen Airlines**					
Ambassadair (USA)	Boeing 707-123B	4x P&W JT3D-1-MC7	1	—	Leased
	Boeing 720-025	4x P&W JT3C-12	1	—	Leased
	Boeing 720-048	4x P&W JT3C-7	1	—	Leased
American Airlines (USA)	Boeing 707-323B	4x P&W JT3D-3	7	—	Leased
	Boeing 707-323C	4x P&W JT3D-3	27	—	Nine leased
	Boeing 727-123	3x P&W JT8D-1	51	—	
	Boeing 727-135	3x P&W JT8D-1	3	—	
	Boeing 727-195	3x P&W JT8D-1	1	—	
	Boeing 727-1A7C	3x P&W JT8D-9	1	—	Leased
	Boeing 727-2A7	3x P&W JT8D-9	1	—	Leased
	Boeing 727-223	3x P&W JT8D-9	87	—	Forty-seven leased
	Boeing 727-223 Advanced	3x P&W JT8D-15	10	12	Nine leased
	Boeing 727-227 Advanced	3x P&W JT8D-9	15	—	
	Boeing 747-123	4x P&W JT9D-3A	8	—	Seven leased
	Boeing 747-123F	4x P&W JT9D-3A	6	—	
	Boeing 757-223	2x P&W PW2037	—	15	Plus fifteen options
	Boeing 767-223	2x GE CF6-80A	—	30	
	Douglas DC-10-10	3x GE CF6-6D	34	—	Seven leased
American Eagle Airlines (W. Germany)	Boeing 707-321B	4x P&W JT3D-3B	3	—	Leased
ANDES — see **Aerolineas Nacionales del Ecuador**					
ANHSA — see **Aerovias Nacionales de Honduras SA**					
Ansett Airlines of Australia (Australia)	Boeing 727-277 Advanced	3x P&W JT8D-15	12	4	
	Boeing 737-277 Advanced	2x P&W JT8D-15	—	12	
	Boeing 767-277	2x GE CF6-80A	—	5	
	Douglas DC-9-31	2x P&W JT8D-7	12	—	
	Fokker F-27-200	2x RR Dart 532-7	8	—	One leased
	Fokker F-27-600	2x RR Dart 532-7	4	—	
	Fokker F-28-1000	2x RR Spey 555-15	1	—	
	Lockheed L-188A(F)	4x Asn 501-D13	3	—	
Ansett Airlines of New South Wales (Australia)	Fokker F-27-500	2x RR Dart 532-7	6	—	Leased
Ansett Airlines of South Australia (Australia)	Fokker F-27-200	2x RR Dart 532-7	1	—	
Antillaanse Luchtvaart Mij — **ALM** (Netherlands Antilles)	Douglas DC-9-32	2x P&W JT8D-15	4	—	
Apollo Airways (USA)	BAe HP-137 Jetstream	2x Tbm Astazou XVIF1	6	—	Two leased
ARCA — see **Aerovias Colombianas**					
ARCO — see **Aerolineas Colonia**					
Arctic Circle Air Service (USA)	Embraer EMB-110P1	2x P&W PT6A-34	1	—	Leased
Ariana Afghan Airlines (Afghanistan)	Boeing 727-113C	3x P&W JT8D-7	1	—	
	Boeing 727-155C	3x P&W JT8D-7	1	—	
	Douglas DC-10-30	3x GE CF6-50C	1	—	In storage
Arkia, Israel Inland Airlines (Israel)	BAe Viscount 831	4x RR Dart 525	3	—	
	BAe Viscount 833	4x RR Dart 530	2	—	
	DH Canada DHC-7-100	4x P&WC PT6A-50	—	3	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
ASAP Air (USA)	Govt Acft Factories N-22B	2x Asn 250-B17B	1	—	Leased
	Govt Acft Factories N-24A	2x Asn 250-B17B	3	—	Leased
Aspen Airways (USA)	Convair 580	2x Asn 501-D13H	10	—	
Associated Airlines (Australia)	Grumman G-159 Gulfstream I	2x RR Dart 529-8E	2	—	
	Grumman G-1159 Gulfstream II	2x RR Spey 511-8	2	—	
Athabaska Airways (Canada)	Cessna 441	2x AiR TPE331-8	1	—	
	DH Canada DHC-2 Mk.III	1x P&WC PT6A-20	1	—	
	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	Sikorsky S-55BT	1x AiR TSE331-3U	3	—	
ATI — see **Aero Trasporti Italiani**					
Atlantic Southeast Airlines (USA)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	2	—	Leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	—	1	
	Embraer EMB-110P1	2x P&WC PT6A-34	2	—	
Atlantida Lineo Aerea Sudamericana — ALAS (Uruguay)	Boeing 707-321	4x P&W JT4A-12	1	—	Leased
Atlantis Airlines (USA)	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	One leased
Aurigny Air Services (UK)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Austin Airways/White River Air Services (Canada)	BAe HS-748 Series 2	2x RR Dart 534-2	5	—	
	BAe HS-748 Series 2A	2x RR Dart 534-2	3	—	
	Cessna 500 Citation I	2x P&WC JT15D-1	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	9	—	Two leased from norOntair
Austral Lineas Aereas — ALA (Argentina)	BAe One-Eleven Srs 500	2x RR Spey 512-14DW	9	—	
	Douglas DC-9-81	2x P&W JT8D-209	2	3	Plus 2 options
Austrian Airlines (Austria)	Airbus A310-220	2x P&W JT9D-7R4D	—	2	Plus 2 options
	Douglas DC-9-32	2x P&W JT8D-9	8	—	
	Douglas DC-9-51	2x P&W JT8D-17	5	—	
	Douglas DC-9-81	2x P&W JT8D-209	3	6	
Austrian Air Services (Austria)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	2	—	
AVENSA — see **Aerolineas Venezolanas**					
AVIACO — Aviacion y Commercio (Spain)	Douglas DC-8-52	4x P&W JT3D-3B	2	—	
	Douglas DC-8-54F	4x P&W JT3D-3B	1	—	
	Douglas DC-8-55F	4x P&W JT3D-3B	3	—	
	Douglas DC-8-63	4x P&W JT3D-7	4	—	Two leased
	Douglas DC-9-32	2x P&W JT8D-9A	11	—	Three with -9 engines
	Douglas DC-9-34	2x P&W JT8D-17	4	—	
	Douglas DC-9-34F	2x P&W JT8D-17	4	—	
	Fokker F-27-100	2x RR Dart 514-7	5	—	
AVIATECA — see **Empresa Guatemalteca de Aviacion**					
Aviogenex (Yugoslavia)	Tupolev Tu-134A	2x Sol D-30-2	7	—	
	Yakovlev Yak-42	3x Lot D-36	—	2	
Aviones Comerciales de Guatemala (Guatemala)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Bahamasair (Bahamas)	BAe HS-748 Srs 2A	2x RR Dart 536-2	4	—	
	Boeing 737-247	2x P&W JT8D-9A	1	—	Leased
	Boeing 737-2V5 Advanced	2x P&W JT8D-17	1	—	
Bakhtar Afghan Airlines (Afghanistan)	Antonov An-24	2x Ivc AI-24	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	
	Yakovlev Yak-40	3x Ivc AI-25	2	—	
BAL — see **Bursa Hava Yollari**					
Balair (Switzerland)	Douglas DC-8-62F	4x P&W JT3D-7	1	—	
	Douglas DC-8-63	4x P&W JT3D-7	1	—	
	Douglas DC-9-32	2x P&W JT8D-9	1	—	
	Douglas DC-9-34	2x P&W JT8D-9	1	—	
	Douglas DC-10-30	3x GE CJ6-50C	1	—	
	Fokker F-27-400	2x RR Dart 532-7	1	—	Leased
Balkan Bulgarian Airlines (Bulgaria)	Antonov An-12B	4x Ivc AI-20K	1	—	
	Antonov An-24V	2x Ivc AI-24A	8	—	
	Ilyushin Il-18D	4x Ivc AI-20M	3	—	
	Ilyushin Il-18V	4x Ivc AI-20K	4	—	
	Tupolev Tu-134	2x Sol D-30	5	—	
	Tupolev Tu-134A	2x Sol D-30-2	4	—	
	Tupolev Tu-154	3x Kuz NK-8-2	7	—	
	Tupolev Tu-154A	3x Kuz NK-8-2U	2	—	
	Tupolev Tu-154B-2	3x Kuz NK-8-2U	4	—	
	Yakovlev Yak-40	3x Ivc AI-25	3	—	
Bangladesh Biman (Bangladesh)	Boeing 707-349C	4x P&W JT3D-3B	1	—	Leased
	Boeing 707-351C	4x P&W JT3D-3B	3	—	
	Boeing 707-373C	4x P&W JT3D-3B	1	—	
	Fokker F-27-200	2x RR Dart 532-7	2	—	
	Fokker F-27-600	2x RR Dart 532-7	4	—	
	Fokker F-28-4000	2x RR Spey 555-15H	—	2	
Bar Harbor Airways (USA)	Beech 99	2x P&WC PT6A-20	12	—	Seven leased
	CASA C-212-200	2x AiR TPE331-10-501C	—	2	
	Convair 600	2x RR Dart 542-4	4	—	One leased
Bass Aviation (USA)	BAe Viscount 745D	4x RR Dart 510	4	—	
Bavaria Flug (West Germany)	Boeing 737-2K9 Advanced	2x P&W JT8D-15	2	2	
Bayu Indonesia Air (Indonesia)	Canadair CL-44-4	4x RR Tyne 515-12	1	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Bearskin Lake Air Service (Canada)	Beech 99A	2x P&WC PT6A-27	1	—	
	Beech B99	2x P&WC PT6A-28	—	(1)	
	Saunders ST-27	2x P&WC PT6A-34	1	—	Leased
Belize Airways (Belize)	Boeing 720-022	4x P&W JT3C-7	2	—	
	Boeing 720-022F	4x P&W JT3C-7	1	—	
Big Sky Airlines (USA)	BAe HP-137 Jetstream	2x Tbm Astazou XVIF1	3	—	One leased
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	2	—	Leased
Bluebell Aviation (USA)	Canadair CL-44D-6	4x RR Tyne 515-10	1	—	
	Mitsubishi MU-2B-30 (MU-2G)	2x AiR TPE331-10-501	1	—	
	Mitsubishi MU-2B-35 (MU-2J)	2x AiR TPE331-10-501	1	—	
Bouraq Indonesia Airlines (Indonesia)	BAe HS-748 Series 2A	2x RR Dart 534-2	11	—	
	Nurtanio (CASA) NC-212-5	2x AiR TPE331-5-251C	3	—	
Braathens S.A.F.E. Airtransport (Norway)	Boeing 737-205	2x P&W JT8D-9	3	—	One leased
	Boeing 737-205 Advanced	2x P&W JT8D-9	7	—	Three have -17 engines
	Boeing 737-205C	2x P&W JT8D-9	1	—	
	Boeing 767-205	2x undecided	—	2	Plus two options
	Fokker F-28-1000	2x RR Spey 555-15	4	—	
Braniff Airways (USA)	Boeing 727-127	3x P&W JT8D-7A	1	—	
	Boeing 727-191	3x P&W JT8D-7A	4	—	Leased
	Boeing 727-127C	3x P&W JT8D-7A	7	—	
	Boeing 727-130C	3x P&W JT8D-7A	2	—	Leased
	Boeing 727-162C	3x P&W JT8D-7A	2	—	
	Boeing 727-172C	3x P&W JT8D-7A	1	—	Leased
	Boeing 727-2B7	3x P&W JT8D-9	2	—	Leased
	Boeing 727-214	3x P&W JT8D-9	1	—	
	Boeing 727-227	3x P&W JT8D-9	2	—	Leased
	Boeing 727-291	3x P&W JT8D-9	3	—	
	Boeing 727-227 Advanced	3x P&W JT8D-9	40	5	
	Boeing 727-227 Advanced	3x P&W JT8D-17R	14	5	Six leased
	Boeing 747-127	4x P&W JT9D-7A	1	—	Leased
	Boeing 747-130	4x P&W JT9D-7A	1	—	Leased
	Boeing 747-227B	4x P&W JT9D-7Q	1	2	
	Boeing 747-230B	4x P&W JT9D-7A	1	—	Leased
	Boeing 747SP-27	4x P&W JT9D-7J	1	—	
	Douglas DC-8-62	4x P&W JT3D-3B	9	—	Two leased, one w/-7A engines
	Douglas DC-8-62F	4x P&W JT3D-3B	1	—	
Brit'Air — Brittany Air Intl (France)	Embraer EMB-110P2	2x P&WC PT6A-34	4	—	
Britannia Airways (UK)	Boeing 737-204	2x P&W JT8D-9	6	—	
	Boeing 737-222	2x P&W JT8D-9	1	—	
	Boeing 737-2U4 Advanced	2x P&W JT8D-15	1	—	
	Boeing 737-204 Advanced	2x P&W JT8D-9	2	—	
	Boeing 737-204 Advanced	2x P&W JT8D-15	13	3	
	Boeing 737-219 Advanced	2x P&W JT8D-15	1	—	
	Boeing 737-204C	2x P&W JT8D-9	2	—	
	Boeing 767-204	2x undecided	—	2	
British Air Ferries (UK)	BAe Viscount 800	4x RR Dart 510	—	(5)	
	Handley Page Herald 200	2x RR Dart 527-7	1	—	
	Handley Page Herald 400	2x RR Dart 527-7	2	—	
British Airtours (UK)	Boeing 707-336C	4x P&W JT3D-B	1	—	
	Boeing 737-236 Advanced	2x P&W JT8D-15	9	—	
	Lockheed L-1011-200	3x RR RB.211-524B	2	—	
British Airways (UK)	Aero/BAe Concorde	4x R/S Olympus 593	7	—	
	BAe One-Eleven Srs 401AK	2x RR Spey 511-14	2	—	
	BAe One-Eleven Srs 408EF	2x RR Spey 511-14	2	—	
	BAe One-Eleven Srs 416EK	2x RR Spey 511-14	1	—	
	BAe One-Eleven Srs 510ED	2x RR Spey 512-14DW	18	—	
	BAe One-Eleven Srs 539GL	2x RR Spey 512-14DW	3	—	
	BAe (HS) Trident 1	3x RR Spey 505-5F	7	—	
	BAe (HS) Trident 2E	3x RR Spey 512-5W	16	—	
	BAe (HS) Trident 3B	3x RR Spey 512-5W	25	—	
	BAe HS-748 Series 2A	2x RR Dart 535-2	2	—	
	BAe Viscount 806	4x RR Dart 510	6	—	
	Boeing 707-336B	4x P&W JT3D-3B	2	—	
	Boeing 707-336C	4x P&W JT3D-3B	2	—	
	Boeing 707-365C	4x P&W JT3D-3B	1	—	
	Boeing 707-379C	4x P&W JT3D-3B	1	—	
	Boeing 737-236 Advanced	2x P&W JT8D-15	19	—	
	Boeing 747-136	4x P&W JT9D-7	16	—	
	Boeing 747-236B	4x RR RB.211-524B	10	1	
	Boeing 747-236F	4x RR RB.211-524B	1	—	
	Boeing 757-236	2x RR RB.211-535B	—	19	
	Lockheed L-1011-1	3x RR RB.211-22B	9	—	
	Lockheed L-1011-200	3x RR RB.211-524B	6	—	
	Lockheed L-1011-500	3x RR RB.211-524B	6	—	
British Airways Helicopters (UK)	Agusta-Bell 206B	1x Asn 250-C20	1	—	
	Bell 212	2x P&WC PT6T-3	2	—	
	Boeing-Vertol 234LR	2x AvL AL5512	1	5	
	Sikorsky S-58ET	2x P&WC PT6T-6	2	—	
	Sikorsky S-61N	2x GE CT58-140-1	24	—	
	Sikorsky S-76A	2x Asn 250-C30	2	—	
	Westland WG30	2x RR Gem 41-1	—	2	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
British Caledonian Airways (UK)	Airbus A310-202	2x GE CF6-80A1	—	3	Plus 3 options
	BAe One-Eleven Srs 201AC	2x RR Spey 506	7	—	
	BAe One-Eleven Srs 501EX	2x RR Spey 512-14DW	7	—	
	BAe One-Eleven Srs 530FX	2x RR Spey 512-14DW	2	—	
	Boeing 707-338C	4x P&W JT3D-3B	3	—	
	Boeing 707-355C	4x P&W JT3D-3B	2	—	One leased
	Boeing 707-365C	4x P&W JT3D-3B	1	—	
	Douglas DC-10-30	3x GE CF6-50C	7	1	
British Caledonian Helicopters (UK)	Agusta-Bell 206B	1x Asn 250-C20	1	—	
	Bell 206B	1x Asn 250-C20	1	—	
	Boeing-Vertol 234	2x AvL AL5512	—	2	
	MBB Bo 105	2x Asn 250-C20B	3	—	
	Sikorsky S-61N	2x GE CT58-140-2	3	—	One leased
	Sikorsky S-76A	2x Asn 250-C30	1	—	
British Cargo Airlines (UK)	Douglas DC-8-54F	4x P&W JT3D-3B	3	—	
	Douglas DC-8-55F	4x P&W JT3D-3B	1	—	
British Midland Airways (UK)	BAe Viscount 813	4x RR Dart 530	7	—	
	BAe Viscount 814	4x RR Dart 530	2	—	
	BAe Viscount 816	4x RR Dart 530	1	—	
	Boeing 707-321C(F)	4x P&W JT3D-3B	1	—	Leased
	Boeing 707-338C	4x P&W JT3D-3B	2	—	
	Douglas DC-9-15	2x P&W JT8D-7	3	—	
Britt Airways (USA)	Beech 99	2x P&WC PT6A-20	12	—	
	Fairchild FH-227C	2x RR Dart 532-7	2	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	7	—	Two leased
Brymon Airways (UK)	DH Canada DHC-6-300	2x P&WC PT6A-27	5	—	
	DH Canada DHC-7-100	4x P&WC PT6A-50	—	2	
	Handley Page Herald 200	2x RR Dart 527-7	1	—	
Burma Airways (Burma)	DH Canada DHC-6-300	2x P&WC PT6A-27	7	—	
	Fokker F-27-200	2x RR Dart 532-7R	1	—	
	Fokker F-27-400	2x RR Dart 532-7R	1	—	
	Fokker F-27-600	2x RR Dart 532-7R	4	—	
	Fokker F-28-1000	2x RR Spey 555-15	2	—	
	Fokker F-28-4000	2x RR Spey 555-15H	1	—	
Burse Hava Yollari — BAL (Turkey)	CASA C-212-5	2x AiR TPE331-5-251	2	—	
	Douglas DC-8-21	4x P&W JT4A-9	1	—	
	Douglas DC-8-52	4x P&W JT3D-3B	2	—	
Bush Pilots Airways (Australia)	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	
	Fokker F-27-200	2x RR Dart 532-7	1	—	
	Govt Acft Factories N-22B	2x Asn 250-B17B	1	—	Leased
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	5	—	
Busy Bee of Norway (Norway)	Boeing 737-2R4C	2x P&W JT8D-17	1	—	
	Fokker F-27-100	2x RR Dart 514-7	4	—	
	Fokker F-27-300	2x RR Dart 514-7	1	—	
	Shorts SC-7 Skyliner Srs 3	2x AiR TPE331-201	1	—	
CAAC — see Civil **Aviation Administration of China**					
Calm Air International (Canada)	BAe HS-748 Series 2A	2x RR Dart 535-2	1	—	
	DH Canada DHC-6-100	2x P&WC PT6A-20	3	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
Cameroon Airlines — Cam-Air (Cameroun)	Boeing 707-3H7C	4x P&W JT3D-3B	1	—	
	Boeing 707-329C	4x P&W JT3D-3B	1	—	Leased
	Boeing 737-2H7C Advanced	2x P&W JT8D-9A	3	—	
	Boeing 747-2H7B Combi	4x P&W JT9D-7A	—	1	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
Canadian Pacific Air Lines — see **CP Air**					
Cape Smythe Air Service (USA)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
Capitol Airlines (USA)	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
Capitol International Airlines (USA)	Douglas DC-8-61	4x P&W JT3D-3B	5	—	Leased
	Douglas DC-8-63F	4x P&W JT3D-3B	2	—	One leased
	Gates Learjet 23	2x GE CJ610-4	1	—	
Cargo Airlines (Israel)	Boeing 747-124F	4x P&W JT9D-7A	1	—	Leased
	Boeing 747-258C	4x P&W JT9D-7F	1	—	Leased
Cargo Charter (Zaire)	Boeing 707-436	4x RR Conway 508	1	—	
Cargolux Airlines International (Luxembourg)	Boeing 747-2R7F	4x P&W JT9D-7Q	2	—	One leased, has -70A engines
	Douglas DC-8-53	4x P&W JT3D-3B	1	—	
	Douglas DC-8-63F	4x P&W JT3D-7	3	—	Two leased
Carter Air Service (Canada)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
Cascade Airways (USA)	BAe HS-748 Series 2B	2x RR Dart 536-2	—	4	
	Beech 99	2x P&WC PT6A-20	7	—	Four leased
	Beech 99A	2x P&WC PT6A-27	3	—	One leased
	Embraer EMB-110P1	2x P&WC PT6A-34	3	—	Leased
Catalina Airlines (USA)	Sikorsky S-58ET	1x P&WC PT6T-6	2	—	
	Sikorsky S-62A	1x GE CT58-100-1	1	—	
Cathay Pacific Airways (Hong Kong)	Boeing 707-351C	4x P&W JT3D-3B	6	—	
	Boeing 747-267B	4x RR RB.211-524B	2	3	
	Lockheed L-1011-1	3x RR RB.211-22B	7	—	Three leased
	Lockheed L-1011-100	3x RR RB.211-22B	2	—	
Cayman Airways (Cayman Islands)	BAe One-Eleven Srs 523FJ	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 531FS	2x RR Spey 512-14DW	1	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Centrafricair (Centrafrique)	Aerospatiale Caravelle III	2x RR Avon 527B	1	—	
Central Airways (Nigeria)	Boeing 727-134	3x P&W JT8D-7A	1	—	Leased
Century Airlines (USA)	Govt Acft Factories N-24A	2x Asn 250-B17B	2	—	One leased
Chaparral Airlines (USA)	Beech 99	2x P&WC PT6A-20	1	—	
	Beech 99A	2x P&WC PT6A-27	3	—	
	CASA C-212-200	2x AiR TPE331-10-501C	2	—	
Chautauqua Airlines (USA)	Beech 99	2x P&WC PT6A-20	1	—	Leased
	Beech 99A	2x P&WC PT6A-27	1	—	
	Beech B99	2x P&WC PT6A-27	2	—	
	Shorts 330	2x P&WC PT6A-45	2	—	
	Shorts 360	2x P&WC PT6A-65R	—	2	
China Airlines (Taiwan)	Airbus A300-200	2x undecided	—	4	
	Boeing 707-351B	4x P&W JT3D-3B	1	—	
	Boeing 707-309C	4x P&W JT3D-3B	1	—	
	Boeing 707-321C	4x P&W JT3D-3B	1	—	
	Boeing 707-324C	4x P&W JT3D-3B	1	—	
	Boeing 727-109	3x P&W JT8D-7B	2	—	
	Boeing 727-109C	3x P&W JT8D-7B	1	—	
	Boeing 727-121C	3x P&W JT8D-7B	1	—	
	Boeing 737-281	2x P&W JT8D-9A	3	—	
	Boeing 747-132	4x P&W JT9D-7	1	—	
	Boeing 747-209B	4x P&W JT9D-7A	3	2	
	Boeing 747-209F	4x P&W JT9D-7Q	1	—	
	Boeing 747SP-09	4x P&W JT9D-7A	2	1	
	Boeing 767-209	2x P&W JT9D-7R4D	—	2	
Cimber Air (Denmark)	Fokker F-28-3000	2x RR Spey 555-15	2	—	
	VFW-Fokker VFW-614	2x R/S M45H Mk 501	2	—	
City Flug (West Germany)	Cessna 500 Citation I	2x P&WC JT15D-1	2	—	
	Swearingen SA-226AT Merlin IV	2x AiR TPE331-3UW-303G	1	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	1	—	
Civil Aviation Administration of China — CAAC (China)	Antonov An-24	2x Ivc AI-24	2	—	
	BAe (HS) Trident 1E	3x RR Spey 511-5	3	—	
	BAe (HS) Trident 2E	3x RR Spey 512-5W	33	—	
	BAe (HS) Trident 3B	3x RR Spey 512-5W	2	—	
	BAe Viscount 843	4x RR Dart 506	6	—	
	Boeing 707-3J6B	4x P&W JT3D-7	5	—	
	Boeing 707-3J6C	4x P&W JT3D-7	5	—	
	Boeing 747SP-J6	4x P&W JT9D-7A	3	—	One leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	4	—	
	Ilyushin Il-62	4x Kuz NK-8-4	5	—	
Clubair (Australia)	Govt Acft Factories N-22B	2x Asn 250-B17B	1	—	
Cochise Airlines (USA)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	3	—	Leased
Coleman Air Transport (USA)	Douglas DC-9-15C	2x P&W JT8D-7A	1	—	Leased
	Grumman G-159 Gulfstream I	2x RR Dart 529-8E	1	—	
Colgan Airways (USA)	Beech 99	2x P&WC PT6A-20	1	—	
	Beech 99A	2x P&WC PT6A-27	1	—	
Comair (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	2	—	Leased
Combs Airways/Freightair (USA)	Cessna 500 Citation I	2x P&WC JT15D-1	1	—	Leased
	Gates Learjet 24D	2x GE CJ610-6	1	—	
	Gates Learjet 25	2x GE CJ610-6	1	—	Leased
	Gates Learjet 35A	2x AiR TFE731-2-2B	1	—	Leased
	Grumman G-159 Gulfstream I	2x RR Dart 529-8E	1	—	Leased
	Lockheed L-188A	4x Asn 501-D13	1	—	Leased
	Lockheed L-188A(F)	4x Asn 501-D13	1	—	Leased
	Lockheed L-1329 Jetstar 6	4x P&W JT12A-6	1	—	Leased
	Lockheed L-1329 Jetstar 731	4x AiR TFE731-3-1F	1	—	Leased
Command Airways (USA)	Shorts 330	2x P&WC PT6A-45	5	—	
Commercial Airways (South Africa)	Fokker F-27-200	2x RR Dart 532-7R	3	—	
Commuter Airlines (USA)	Convair 580	2x Asn 501-D13D	2	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	4	—	
Compagnie Aerienne du Languedoc (France)	Beech 99	2x P&WC PT6A-20	2	—	Leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	Embraer EMB-110P2	2x P&WC PT6A-34	1	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	3	—	
Compagnie de Transport Aerien — see **CTA** (Switzerland)					
Compania de Aviacion Faucett (Peru)	BAe One-Eleven Srs 476FM	2x RR Spey 512-14DW	2	—	
	BAe One-Eleven Srs 523FJ	2x RR Spey 512-14DW	1	—	
	Boeing 707-331B	4x P&W JT3D-3B	1	—	Leased
	Boeing 707-331C	4x P&W JT3D-3B	1	—	Leased
	Boeing 727-163	3x P&W JT8D-7A	1	—	
	Boeing 727-151C	3x P&W JT8D-7A	1	—	Leased
Compania de Aviacion TransEuropa (Spain)	Aerospatiale Caravelle 10B	2x P&W JT8D-1	5	—	
	Aerospatiale Caravelle 11R	2x P&W JT8D-7R	1	—	
	Fokker F-27-600	2x RR Dart 532-7	1	—	Leased
Compania Dominicana de Aviacion (Dominican Republic)	Boeing 727-1J1	3x P&W JT8D-9	1	—	
	Boeing 727-173C	3x P&W JT8D-7	1	—	
	Boeing 727-2J1 Advanced	3x P&W JT8D-9	1	—	
Compania Mexicana de Aviacion — see **Mexicana Airlines**					

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Compania Panamena de Aviacion — COPA (Panama)	Boeing 737-112	2x P&W JT8D-9	3	—	Two leased
	Lockheed L-188A	4x Asn 501-D13	2	—	
	Lockheed L-188C	4x Asn 501-D13	1	—	
Conair (Denmark)	Boeing 720-025	4x P&W JT3C-12	4	—	
Concord International Airlines (USA)	Douglas DC-8-21	4x P&W JT4A-9	1	—	Leased
	Douglas DC-8-31F	4x P&W JT4A-9	1	—	Leased
Condor Flugdienst (West Germany)	Boeing 727-130	3x P&W JT8D-7	4	—	
	Boeing 727-230 Advanced	3x P&W JT8D-15	8	—	Two leased
	Boeing 737-230 Advanced	2x P&W JT8D-15	1	3	
	Douglas DC-10-30	3x GE CF6-50C2	3	—	
Consorcio Tecnico de Aeronautica — CTA	Fokker F-27-100	2x RR Dart 514-7	1	—	
	Lockheed L-382E	4x Asn 501-D22A	1	—	
Contact Airways (Canada)	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
Continental Airlines (USA)	Boeing 727-122	3x P&W JT8D-9	3	—	
	Boeing 727-130	3x P&W JT8D-9	2	—	
	Boeing 727-151	3x P&W JT8D-9	2	—	Leased
	Boeing 727-176	3x P&W JT8D-9	1	—	
	Boeing 727-122C	3x P&W JT8D-9	6	—	
	Boeing 727-214 Advanced	3x P&W JT8D-9	1	—	Leased
	Boeing 727-224	3x P&W JT8D-9	21	—	
	Boeing 727-224 Advanced	3x P&W JT8D-9	15	—	
	Boeing 727-224 Advanced	3x P&W JT8D-15	4	5	Leased
	Douglas DC-10-10	3x GE CF6-6D	7	—	
	Douglas DC-10-10F	3x GE CF6-6D	5	—	
	Douglas DC-10-30	3x GE CF6-50C2	2	—	Leased
COPA — see **Compania Panamena de Aviacion**					
Coral Air (USA)	Govt Acft Factories N-22B	2x Asn 250-B17B	1	—	Leased
	Govt Acft Factories N-24A	2x Asn 250-B17B	4	—	Leased
	Shorts 330	2x P&WC PT6A-45B	1	1	
CP Air — Canadian Pacific Air Lines (Canada)	Boeing 727-217 Advanced	3x P&W JT8D-17	2	—	
	Boeing 737-217	2x P&W JT8D-9	7	—	
	Boeing 737-217 Advanced	2x P&W JT8D-17	8	5	
	Boeing 747-217B	4x P&W JT9D-7A	4	—	
	Boeing 767-217	2x undecided	—	4	
	Douglas DC-8-43	4x RR Conway 509	2	—	
	Douglas DC-8-53	4x P&W JT3D-3B	1	—	
	Douglas DC-8-63	4x P&W JT3D-7	5	—	
	Douglas DC-10-30	3x GE CF6-50C2	4	2	Two with -50C1 engines
Crossair (Switzerland)	Saab-Fairchild 340	2x GE CT7-5	—	5	Plus 5 options
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	3	—	
	Swearingen SA-227AC Metro III	2x AiR TPE331-11U-601G	—	3	
Crown Airways (USA)	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	Shorts 330	2x P&WC PT6A-45	2	—	
Cruzeiro do Sul (Brazil)	Airbus A300B4-203	2x GE CF6-50C2	2	—	
	Boeing 727-1C3	3x P&W JT8D-9	3	—	
	Boeing 727-111	3x P&W JT8D-9	1	—	
	Boeing 727-125	3x P&W JT8D-9	2	—	
	Boeing 727-129	3x P&W JT8D-9	1	—	
	Boeing 727-193	3x P&W JT8D-9	1	—	
	Boeing 737-2C3 Advanced	2x P&W JT8D-17	6	—	
CSA — see **Czechoslovak Airlines**					
CTA (Switzerland)	Aerospatiale Caravelle 10B	2x P&W JT8D-7	4	—	
CTA (Angola) — see **Consorcio Tecnico de Aeronautica** (Angola)					
Cubana — Empresa Consolidada Cubana de Aviacion (Cuba)	Antonov An-24V	2x Ivc AI-24A	3	—	
	Antonov An-26	2x Ivc AI-24T	5	—	
	Bristol 175 Britannia 310	4x Br Proteus 765	3	—	
	Ilyushin Il-18D	4x Ivc AI-20M	2	—	
	Ilyushin Il-18V	4x Ivc AI-20K	1	—	
	Ilyushin Il-62M	4x Sol D-30KU	4	—	
	Tupolev Tu-134A	2x Sol D-30-2	1	—	Leased
	Yakovlev Yak-40	3x Ivc AI-25	5	—	
Cumberland Airlines (USA)	Beech 99	2x P&WC PT6A-20	1	—	Leased
Cyprus Airways (Cyprus)	BAe One-Eleven Srs 537GF	2x RR Spey 512-14DW	3	—	
	Boeing 707-123B	4x P&W JT3D-3B	5	—	
Czechoslovak Airlines — CSA (Czechoslovakia)	Ilyushin Il-18D	4x Ivc AI-20M	1	—	
	Ilyushin Il-18E	4x Ivc AI-20M	1	—	
	Ilyushin Il-18V	4x Ivc AI-20K	6	—	
	Ilyushin Il-62	4x Kuz NK-8-4	7	—	
	Ilyushin Il-62M	4x Sol D-30KU	3	—	
	Let L-410A	2x P&WC PT6A-27	11	—	
	Tupolev Tu-134A	2x Sol D-30-2	13	—	
	Yakovlev Yak-40	3x Ivc AI-25	9	—	
	Yakovlev Yak-40F	3x Ivc AI-25	8	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Dan-Air Services (UK)	BAe One-Eleven Srs 207AJ	2x RR Spey 506-14	2	—	
	BAe One-Eleven Srs 301AG	2x RR Spey 511-14	2	—	
	BAe One-Eleven Srs 401AK	2x RR Spey 511-14	2	—	
	BAe One-Eleven Srs 414EG	2x RR Spey 511-14	1	—	
	BAe One-Eleven Srs 509EW	2x RR Spey 512-14DW	2	—	
	BAe One-Eleven Srs 518FG	2x RR Spey 512-14DW	4	—	
	BAe One-Eleven Srs 520FN	2x RR Spey 512-14DW	1	—	
	BAe HS-748 Series 1	2x RR Dart 514-6	9	—	
	BAe HS-748 Series 2	2x RR Dart 531-7	4	—	
	BAe HS-748 Series 2A	2x RR Dart 532-2L	6	1	One leased
	Boeing 727-146	3x P&W JT8D-7A	4	—	Two leased
	Boeing 727-193	3x P&W JT8D-7A	1	—	
	Boeing 727-195	3x P&W JT8D-7A	2	—	
	Boeing 727-2J4 Advanced	3x P&W JT8D-15	2	—	
	Boeing 727-212 Advanced	3x P&W JT8D-17	1	—	
	Boeing 737-2L9 Advanced	2x P&W JT8D-17	1	—	Leased
Danbury Airways (USA)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
	Gates Learjet 24A	2x GE CJ610-4	1	—	
Davey Air Services (Australia)	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	
Delta Air Lines (USA)	Boeing 727-291	3x P&W JT8D-15	2	—	
	Boeing 727-295	3x P&W JT8D-15	11	—	Four leased
	Boeing 727-232 Advanced	3x P&W JT8D-15	113	3	
	Boeing 757-232	2x P&W PW2037	—	60	
	Boeing 767-232	2x GE CF6-80A	—	42	
	Douglas DC-8-51	4x P&W JT3D-1	4	—	
	Douglas DC-8-61	4x P&W JT3D-3B	13	—	
	Douglas DC-9-32	2x P&W JT8D-7A	36	—	
	Lockheed L-1011-1	3x RR RB.211-22B	30	8	Plus 9 options
	Lockheed L-1011-200	3x RR RB.211-524	1	—	
	Lockheed L-1011-500	3x RR RB.211-524B	3	—	
Delta Air Regionalflugverkehr (West Germany)	Beech 200	2x P&WC PT6A-41	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
	Piper PA-31T	2x P&WC PT6A-28	2	—	
Delta Air Transport (Belgium)	Fairchild FH-227B	2x RR Dart 532-7	4	—	
Democratic Yemen Airlines — Alyemda (Yemen)	Boeing 707-348C	4x P&W JT3D-3B	1	—	Leased
	Boeing 707-351C	4x P&W JT3D-3B	1	—	
	Boeing 720-023B	4x P&W JT3D-1	1	—	
	DH Canada DHC-7-100	4x P&WC PT6A-50	3	—	
Deraya (Indonesia)	Bell 206B	1x Asn 250-C20	2	—	
	Nurtanio (CASA) NC-212-5	2x AiR TPE331-5-251	4	4	Orders are -200 aircraft
	Piper PA-31T	2x P&WC PT6A-28	1	—	
DETA — see **Linhas Aereas de Mocambique**					
Deutsche Lufthansa (West Germany)	Airbus A300B2-101	2x GE CF6-50C	5	—	
	Airbus A300B4-101	2x GE CF6-50C	6	—	
	Airbus A310-200	2x GE CF6-80A	—	25	Plus 25 options
	Beech B90	2x P&WC PT6A-20	1	—	
	Beech C90	2x P&WC PT6A-20	4	—	
	Boeing 707-330B	4x P&W JT3D-3B	5	—	
	Boeing 707-330C	4x P&W JT3D-3B	1	—	
	Boeing 727-230	3x P&W JT8D-15	4	—	
	Boeing 727-230 Advanced	3x P&W JT8D-15	22	—	
	Boeing 737-130	2x P&W JT8D-7	22	—	
	Boeing 737-230 Advanced	2x P&W JT8D-15	—	35	
	Boeing 737-230C	2x P&W JT8D-9	6	—	
	Boeing 747-230B	4x GE CF6-50E	3	1	
	Boeing 747-230B Combi	4x GE CF6-50E	6	3	
	Boeing 747-230F	4x GE CF6-50E	1	1	
	Douglas DC-10-30	3x GE CF6-50C	11	—	
Deutsche Luftverkehrs — DLT (West Germany)	BAe HS-748 Series 2A	2x RR Dart 532-2L	1	—	Leased
	BAe HS-748 Series 2B	2x RR Dart 536-2	—	1	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	Leased
	Fairchild F-27J	2x RR Dart 532-7	1	—	Leased
	Fokker F-27-100	2x RR Dart 514-7	1	—	
	Shorts 330	2x P&WC PT6A-45	6	—	Leased
Dirgantara Air Services (Indonesia)	Nurtanio (CASA) NC-212-5	2x AiR TPE331-5-251	2	1	Order is -200 aircraft
	Fairchild F-27F	2x RR Dart 529-7E	1	—	Leased
Dorado Wings (USA)	BAe HP-137 Jetstream	2x AiR TPE331-3U-303G	3	—	Leased
Douglas Airways (Niugini)	Govt Acft Factories N-22B	2x Asn 250-B17B	2	—	
Duncan Aviation (USA)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
	Swearingen SA-226T(B) Merlin IIIB	2x AiR TPE331-10U-501G	1	—	
Eagle Air (Iceland)	Boeing 707-324C	4x P&W JT3D-3B	1	—	Leased
	Boeing 707-347C	4x P&W JT3D-3B	1	—	Leased
	Boeing 720-047B	4x P&W JT3D-3B	1	—	Leased
	Boeing 737-2Q8 Advanced	2x P&W JT8D-15	1	1	Leased, order is -2E5 Adv
	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	
	Piper PA-31T	2x P&WC PT6A-28	1	—	
Eagle Airways (New Zealand)	Embraer EMB-110P1	2x P&WC PT6A-34	2	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Eastern Air Lines (USA)	Airbus A300B2-201	2x GE CF6-50C	2	—	
	Airbus A300B4-103	2x GE CF6-50C2	17	15	Four leased, plus 5 options
	Airbus A300B4-600	2x GE CF6-80C1	—	—	Plus 21 options
	Boeing 727-125	3x P&W JT8D-7B	44	—	
	Boeing 727-125C	3x P&W JT8D-7B	13	—	
	Boeing 727-214	3x P&W JT8D-7	4	—	Leased
	Boeing 727-225	3x P&W JT8D-7	25	—	Eleven leased
	Boeing 727-225 Advanced	3x P&W JT8D-15	41	21	Twenty-one leased
	Boeing 757-225	2x RR RB.211-535C	—	27	Plus 24 options
	Douglas DC-9-31	2x P&W JT8D-7B	59	—	Twenty-one leased
	Douglas DC-9-51	2x P&W JT8D-15	21	—	Seventeen leased
	Lockheed L-1011-1	3x RR RB.211-22B	26	—	Eleven leased
Eastern Orient Airlines (USA)	Boeing 720-027	4x P&W JT3C-7	1	—	
Eastern Provincial Airways (Canada)	BAe HS-748 Series 2	2x RR Dart 531-7	3	—	
	Boeing 737-2E1	2x P&W JT8D-9	3	—	
	Boeing 737-2E1 Advanced	2x P&W JT8D-9	3	—	
East-West Airlines (Australia)	Fokker F-27-100	2x PR Dart 514-7	2	—	
	Fokker F-27-200	2x RR Dart 532-7	1	—	Leased
	Fokker F-27-500	2x RR Dart 532-7R	6	—	
	Fokker F-28-4000	2x RR Spey 555-15H	—	2	
Ecuavia (Ecuador)	Fairchild FH-227E	2x RR Dart 532-7L	1	—	Leased
Egyptair (Egypt)	Airbus A300B4-101	2x GE CF6-50C	2	—	Leased
	Airbus A300B4-203	2x GE CF6-50C2	2	3	Plus 2 options
	Boeing 707-366C	4x P&W JT3D-7	7	—	
	Boeing 737-266 Advanced	2x P&W JT8D-17R	7	—	
EL AL Israel Airlines (Israel)	Boeing 707-358B	4x P&W JT3D-3B	3	—	
	Boeing 707-358C	4x P&W JT3D-3B	2	—	
	Boeing 707-458	4x RR Conway 508	2	—	
	Boeing 737-2M8 Advanced	2x P&W JT8D-15	2	—	Leased
	Boeing 737-258 Advanced	2x P&W JT8D-17A	—	2	
	Boeing 747-124	4x P&W JT9D-7AH	1	—	
	Boeing 747-238B	4x P&W JT9D-7F	1	—	
	Boeing 747-258B	4x P&W JT9D-7F	3	—	
	Boeing 747-258C	4x P&W JT9D-7F	2	—	
	Boeing 747-258F	4x P&W JT9D-7	1	—	
	Boeing 767-258	2x P&W JT9D-7R4	—	4	
Emerald Airlines (USA)	Fairchild F-27	2x RR Dart 514-7	1	—	Leased
	Fairchild F-27B	2x RR Dart 514-7	1	—	Leased
	Fairchild FH-227C	2x RR Dart 532-7	2	—	
	Grumman G-159 Gulfstream I	2x RR Dart 529-8E	1	—	
Emirates Air Services (United Arab Emirates)	DH Canada DHC-6-300	2x P&WC PT6A-27	4	—	One leased
	DH Canada DHC-7-100	4x P&WC PT6A-50	1	—	
Empire Airlines (USA)	Fokker F-28-4000	2x RR Spey 555-15H	1	1	Leased
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	5	—	Three leased
Empresa Consolidada Cubana de Aviacion — see **Cubana**					
Empresa de Transporte Aereo del Peru — see **Aeroperu**					
Empresa Ecuatoriana de Aviacion (Ecuador)	Boeing 707-321B	4x P&W JT3D-3B	3	—	One leased
	Boeing 707-321C(F)	4x P&W JT3D-3B	1	—	
	Boeing 720-023B	4x P&W JT3D-1	3	—	One leased
Empresa Guatemalteca de Aviacion — AVIATECA (Guatemala)	Boeing 727-125C	3x P&W JT8D-7A	1	—	
	Boeing 727-173C	3x P&W JT8D-7A	1	—	Leased
	Fokker F-27-200	2x RR Dart 532-7	3	—	
Era Helicopters (USA)	Convair 580	2x Asn 501-D13H	2	—	
	DH Canada DHC-6-100	2x P&WC PT6A-20	5	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	3	—	
	Gates Learjet 24B	2x GE CJ610-6	1	—	
	Gates Learjet 24D	2x GE CJ610-6	2	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	1	—	
Ethiopian Airlines (Ethiopia)	Boeing 707-379C	4x P&W JT3D-3B	1	—	
	Boeing 720-024B	4x P&W JT3D-3B	3	—	
	Boeing 720-060B	4x P&W JT3D-3B	2	—	
	Boeing 727-260 Advanced	3x P&W JT8D-17R	2	1	
	DH Canada DHC-5E	2x GE CT64-820-4	—	2	
	DH Canada DHC-6-300	2x P&WC PT6A-27	—	6	
Euralair (France)	Boeing 737-222	2x P&W JT8D-7A	2	—	
	Cessna 500 Citation I	2x P&WC JT15D-1	2	—	
	Cessna 550 Citation II	2x P&WC JT15D-4	3	—	
	Dassault Falcon 10	2x AiR TFE731-2-1C	2	—	One leased
	Dassault Falcon 20C	2x GE CF700-2C	1	—	
	Gates Learjet 24	2x GE CJ610-6	2	—	
	Gates Learjet 24D	2x GE CJ610-6	1	—	
	Gates Learjet 25C	2x GE CJ610-6	1	—	
	Gates Learjet 36	2x AiR TFE731-2-2B	1	—	
Euroair Transport (UK)	Embraer EMB-110P1	2x P&WC PT6A-34	2	—	Leased
Europe Air Service (France)	Aerospatiale Caravelle VIN	2x RR Avon 531	5	—	Two leased
	Aerospatiale Caravelle 10B	2x P&W JT8D-7A	6	—	
	Boeing 727-227 Advanced	3x P&W JT8D-9	1	—	Leased
	Handley Page Herald 210	2x RR Dart 527-7	2	—	One leased
European Air Transport (Belgium)	Swearingen SA-226AT Merlin IV	2x AiR TPE331-3UW-303G	1	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	2	—	

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Evergreen Helicopters (USA)	Aerospatiale SA-318C	1x Tbm Astazou IIA	4	—	
	Bell 212	1x P&WC PT6T-3 Twin-Pac	3	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	8	—	One leased
	Gates Learjet 24D	2x GE CJ610-6	1	—	
	Sikorsky S-64E	2x P&W JFTD12-4A	1	—	
Evergreen International Airlines (USA)	Boeing 727-130C	3x P&W JT8D-7A	1	—	
	Douglas DC-8-52	4x P&W JT3D-3B	1	—	
	Douglas DC-8-61F	4x P&W JT3D-3B	1	—	
	Douglas DC-8-63F	4x P&W JT3D-7	1	—	Leased
	Douglas DC-9-32F	2x P&W JT8D-7	3	—	
	Lockheed L-188A	4x Asn 501-D13	3	—	
	Lockheed L-188A(F)	4x Asn 501-D13	2	—	
	Lockheed L-188C	4x Asn 501-D13	1	—	
Express Air Services (CI) (UK)	Handley Page Herald 209	2x RR Dart 532-9	2	—	Leased
Fairflight — see **Air Ecosse**					
Fairways (USA)	Beech 99	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	Grumman G-159 Gulfstream I	2x RR Dart 529-8E	1	—	
Far Eastern Air Transport (Taiwan)	Boeing 737-130	2x P&W JT8D-7	5	—	
	Boeing 737-222	2x P&W JT8D-7A	2	—	
	Boeing 737-247	2x P&W JT8D-11	3	—	
	Boeing 737-2Q8 Advanced	2x P&W JT8D-7A	2	—	Leased
Federal Express (USA)	Boeing 727-022C	3x P&W JT8D-7	13	—	
	Boeing 727-024C	3x P&W JT8D-7	1	—	
	Boeing 727-025C	3x P&W JT8D-7	7	—	
	Boeing 727-116C	3x P&W JT8D-7	1	—	
	Boeing 737-2S2C Advanced	2x P&W JT8D-17	1	—	
	Dassault Falcon 20	2x GE CF700-2D	8	—	
	Dassault Falcon 20D	2x GE CF700-2D	23	—	
	Dassault Falcon 20E	2x GE CF700-2D	1	—	
	Douglas DC-10-10CF	3x GE CF6-6D	3	—	
Fiji Air (Fiji)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	2	—	
Finnair (Finland)	Aerospatiale Caravelle 10B	2x P&W JT8D-7	8	—	
	Douglas DC-8-62	4x P&W JT3D-3B	1	—	
	Douglas DC-8-62F	4x P&W JT3D-3B	2	—	
	Douglas DC-9-11	2x P&W JT8D-7	2	—	
	Douglas DC-9-14	2x P&W JT8D-7	4	—	
	Douglas DC-9-15	2x P&W JT8D-7	1	—	
	Douglas DC-9-15C	2x P&W JT8D-7	2	—	
	Douglas DC-9-41	2x P&W JT8D-17	—	3	
	Douglas DC-9-51	2x P&W JT8D-17	9	3	
	Douglas DC-10-30	3x GE CF6-50C	2	1	Order has -50C2 engines
	Fokker F-27-200	2x RR Dart 532-7	2	—	
Finnaviation (Finland)	Cessna 425 Corsair	2x P&WC PT6A-112	—	1	
	Cessna 441 Conquest	2x AiR TPE331-8-404	—	1	
	Dassault Falcon 20C	2x GE CF700-2C	1	—	
	Embraer EMB-110P1	2x P&WC PT6A-34	3	—	Two leased
	Rockwell Commander 690	2x AiR TPE331-5-251K	1	—	
First Air/Bradley Air Services (Canada)	BAe HS-748 Series 2A	2x RR Dart 532-2L	3	—	
	Cessna 500 Citation I	2x P&WC JT15D-1	1	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	5	—	
Fischer Brothers Aviation (USA)	CASA C-212-200	2x AiR TPE331-10-501C	3	—	One leased
Fleming International Airways (USA)	Douglas DC-8-33F	4x P&W JT4A-9	1	—	Leased
	Lockheed L-188A(F)	4x Asn 501-D13	1	—	Leased
	Lockheed L-188C	4x Asn 501-D13	3	—	Leased
	Lockheed L-188C(F)	4x Asn 501-D13	4	—	Leased
Flugfelag Nordurlands (Iceland)	DH Canada DHC-6-200	2x P&WC PT6A-20	2	—	Leased
	Mitsubishi MU-2B-36 (MU-2L)	2x AiR TPE331-6-251M	1	—	
Flying Tiger Line (USA)	Boeing 747-123F	4x P&W JT9D-7A	3	—	One leased
	Boeing 747-132F	4x P&W JT9D-7A	3	—	
	Boeing 747-245F	4x P&W JT9D-70A	6	—	Three leased, two w/-7Q engines
	Boeing 747-249F	4x P&W JT9D-7Q	4	—	Two leased
	Douglas DC-8-61F	4x P&W JT3D-3B	7	—	Five leased
	Douglas DC-8-63F	4x P&W JT3D-7	19	—	Twelve leased
Fred Olsens Flyselskap (Norway)	BAe HS-748 Series 2A	2x RR Dart 532-2L	1	—	
	Lockheed L-188A(F)	4x Asn 501-D13	2	—	
	Lockheed L-188C(F)	4x Asn 501-D13	1	—	
Freedom Airlines (USA)	Convair 580	2x Asn 501-D13D	3	—	
Frontier Airlines (USA)	Boeing 737-2C0	2x P&W JT8D-9	5	—	Leased
	Boeing 737-2H4	2x P&W JT8D-9	1	—	
	Boeing 737-214	2x P&W JT8D-9	4	—	
	Boeing 737-222	2x P&W JT8D-9	3	—	
	Boeing 737-247	2x P&W JT8D-9	2	—	
	Boeing 737-291	2x P&W JT8D-9	5	—	Three leased
	Boeing 737-2A1 Advanced	2x P&W JT8D-17	2	—	
	Boeing 737-212 Advanced	2x P&W JT8D-9	1	—	
	Boeing 737-291 Advanced	2x P&W JT8D-9	9	—	
	Boeing 737-291 Advanced	2x P&W JT8D-17	12	1	
	Convair 580	2x Asn 501-D13D	20	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	Douglas DC-9-82	2x P&W JT8D-217	—	3	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Futura Airlines (Canada)	Aero Commander 1121	2x GE CJ610-1	1	—	
	BAe HS-125 Series 400A/731	2x AiR TFE731-3R-1H	1	—	Leased
	Gates Learjet 23	2x GE CJ610-4	1	—	Leased
	Israel Aircraft Industries 1124	2x AiR TFE731-3-1G	1	—	Leased
	Rockwell Commander 680V	2x AiR TPE331-101K	3	—	One has -43BL engines
	Rockwell Commander 681	2x AiR TPE331-101K	2	—	
Garuda Indonesian Airways (Indonesia)	Airbus A300B4-220	2x P&W JT9D-59A	—	6	Plus 6 option.
	Boeing 747-2U3B	4x P&W JT9D-7Q	4	—	
	Douglas DC-9-32	2x P&W JT8D-9A	24	—	
	Douglas DC-10-30	3x GE CF6-50C	6	—	
	Fokker F-28-1000	2x RR Spey 555-15	20	—	
	Fokker F-28-3000	2x RR Spey 555-15	7	—	
	Fokker F-28-4000	2x RR Spey 555-15H	5	2	
Gemini Air Transport (Ghana)	Boeing 707-430	4x RR Conway 508	1	—	
	Bristol 175 Britannia 253	4x Br Proteus 765	1	—	
German Cargo Services (West Germany)	Boeing 707-330C(F)	4x P&W JT3D-3B	4	—	One leased
Ghana Airways (Ghana)	BAe HS-748 Series 2A	2x RR Dart 532-2L	1	—	
	BAe VC-10 Series 1102	4x RR Conway 540	1	—	
	Douglas DC-9-51	2x P&W JT8D-17	1	—	
	Douglas DC-10-30	3x GE CF6-50C	—	1	
	Fokker F-28-2000	2x RR Spey 555-15	2	—	
Gibbs Lease Air (USA)	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	Leased
Gibraltar Airways — Gibair (Gibraltar)	BAe Viscount 807	4x RR Dart 510	1	—	
Gifford Aviation (USA)	Shorts SC-7 Skyvan Srs 3	2x AiR TPE331-201	2	—	One leased
Global International Airways (USA)	Boeing 707-323B	4x P&W JT3D-3B	1	—	Leased
	Boeing 707-331C	4x P&W JT3D-3B	3	—	Two leased
Golden Gate Airlines (USA)	Convair 580	2x Asn 501-D13D	5	—	Leased
	DH Canada DHC-7-102	4x P&WC PT6A-50	4	8	Three leased
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	8	3	Six leased
Golden West Airlines (USA)	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	One leased
	DH Canada DHC-6-200	2x P&WC PT6A-20	10	—	One leased
	DH Canada DHC-7-102	4x P&WC PT6A-50	3	2	
	Shorts 330	2x P&WC PT6A-45	4	—	
Great Shield Air Service (Canada)	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	
Great Western Airlines (USA)	Convair 580	2x Asn 501-D13D	2	—	
Greenlandair (Greenland)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
	DH Canada DHC-7-103	4x P&WC PT6A-50	2	—	One leased
Guernsey Airlines (UK)	BAe Viscount 724	4x RR Dart 506	1	—	
Gulf Air — Gulf Aviation (Bahrain)	Boeing 707-321C	4x P&W JT3D-3B	1	—	Leased
	Boeing 737-2P6 Advanced	2x P&W JT8D-15	9	—	One leased
	Fokker F-27-600	2x RR Dart 532-7	3	—	One leased
	Lockheed L-1011-1	3x RR RB.211-22B	2	—	Leased
	Lockheed L-1011-100	3x RR RB.211-22B	5	—	One leased
	Lockheed L-1011-200	3x RR RB.211-524B	—	3	
	Shorts SC-7 Skyvan Srs 3	2x AiR TPE331-201	4	—	
Gum Air (Surinam)	Govt Acft Factories N-22B	2x Asn 250-B17B	1	—	
Guyana Airways (Guyana)	BAe HS-748 Series 2A	2x RR Dart 532-2L	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Hadag Air Seebaderflug (W. Germany)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Haiti Air Inter (Haiti)	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
Hammonds Air Service (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	
Hang Khong Viet-Nam (Viet-Nam)	Antonov An-24	2x Ivc AI-24	1	—	
	Antonov An-24V	2x Ivc AI-24A	6	—	
	Boeing 707-344	4x P&W JT3D-3B	1	—	Leased
	Tupolev Tu-134A	2x Sol D-30-2	3	—	
	Yakovlev Yak-40	3x Ivc AI-25	1	—	
Hapag-Lloyd-Flug (West Germany)	Airbus A300B4-101	2x GE CF6-50C	3	—	Leased
	Airbus A300B4-103	2x GE CF6-50C2	1	—	Leased
	Airbus A300C4-203	2x GE CF6-50C2	1	—	
	BAe One-Eleven Srs 515FB	2x RR Spey 512-14DW	1	—	Leased
	BAe One-Eleven Srs 528FL	2x RR Spey 512-14DW	1	—	Leased
	Boeing 727-114	3x P&W JT8D-7A	1	—	
	Boeing 727-129	3x P&W JT8D-7A	1	—	
	Boeing 727-146	3x P&W JT8D-7A	1	—	
	Boeing 727-181	3x P&W JT8D-7A	1	—	
	Boeing 727-189	3x P&W JT8D-7A	2	—	
	Boeing 727-2K5 Advanced	3x P&W JT8D-17	1	—	
	Boeing 737-255 Advanced	2x P&W JT8D-17	—	6	
Hawaiian Airlines (USA)	DH Canada DHC-7-100	4x P&WC PT6A-50	—	3	
	Douglas DC-9-32CF	2x P&W JT8D-9A	1	—	Leased
	Douglas DC-9-51	2x P&W JT8D-17	8	—	Five leased
	Douglas DC-9-81	2x P&W JT8D-209	—	6	
Helicol — Helicopteros Nacionales de Colombia (Colombia)	DH Canada DHC-6-300	2x P&WC PT6A-27	1	1	
	Israel Aircraft Industries 1124	2x AiR TFE731-3-1G	1	—	
Henson Aviation (USA)	Beech 99A	2x P&WC PT6A-27	3	—	One leased
	Beech B99	2x P&WC PT6A-27	2	—	
	DH Canada DHC-7-102	4x P&WC PT6A-50	3	—	One leased
	Shorts 330	2x P&WC PT6A-45	4	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
High-Line Airways (Canada)	Beech 65-90	2x P&WC PT6A-6	3	(2)	
	Convair 580	2x Asn 501-D13D	—	(1)	
	Gates Learjet 24	2x GE CJ610-4	1	—	
Iberia — See **Lineas Aereas de Espana**					
Icelandair (Iceland)	Boeing 707-108C	4x P&W JT3D-7A	1	—	
	Boeing 727-185C	3x P&W JT8D-7A	1	—	
	Boeing 727-208 Advanced	3x P&W JT8D-15	1	—	
	Douglas DC-8-63CF	4x P&W JT3D-7	3	—	
	Fokker F-27-200	2x RR Dart 532-7	4	—	
Imperial Airlines (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	5	—	Leased
Indian Airlines (India)	Airbus A300B2-101	2x GE CF6-50C	8	—	Plus 3 options
	BAe (Hindustan) HS-748 Srs 2	2x RR Dart 531-7	14	—	
	Boeing 737-2A8	2x P&W JT8D-9	5	—	
	Boeing 737-2A8 Advanced	2x P&W JT8D-17	12	5	
	Boeing 737-2A8C Advanced	2x P&W JT8D-17	—	1	
	Fokker F-27-100	2x RR Dart 514-7	6	—	
	Fokker F-27-400	2x RR Dart 532-7	1	—	
	Fokker F-27-600	2x RR Dart 532-7	1	—	
Indonesian Air Transport (Indonesia)	Beech 200	2x P&WC PT6A-41	2	—	
	Nurtanio (CASA) NC-212-200	2x AiR TPE331-10-501C	—	1	
Inex-Adria Aviopromet (Yugoslavia)	Douglas DC-9-32	2x P&W JT8D-9	3	—	
	Douglas DC-9-33CF	2x P&W JT8D-9	2	—	
	Douglas DC-9-51	2x P&W JT8D-17	2	—	
	Douglas DC-9-82	2x P&W JT8D-217	—	3	
Inland Empire Airlines (USA)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	4	—	One leased
	Swearingen SA-227AC Metro III	2x AiR TPE331-11U-601G	—	2	
Inter City Airlines (UK) (was named Alidair)	BAe Viscount 708	4x RR Dart 506	2	—	
	BAe Viscount 724	4x RR Dart 506	1	—	
	BAe Viscount 735	4x RR Dart 506	1	—	
	Shorts 330	2x P&WC PT6A-45	2	—	
	Shorts 360	2x P&WC PT6A-65R	—	4	
Intercontinental Airways (USA)	Douglas DC-8-33	4x P&W JT4A-12	2	—	
	Douglas DC-8-33(F)	4x P&W JT4A-12	1	—	
Interflug (West Germany)	Ilyushin Il-18D	4x Ivc AI-20M	4	—	
	Ilyushin Il-18V	4x Ivc AI-20K	10	—	
	Ilyushin Il-62	4x Kuz NK-8-4	5	—	
	Ilyushin Il-62M	4x Sol D-30KU	1	—	
	Tupolev Tu-134	2x Sol D-30	6	—	
	Tupolev Tu-134A	2x Sol D-30-2	13	—	
Interstate Airlines (USA)	Convair 580	2x Asn 501-D13D	11	—	
Inuvik Coastal Airways (Canada)	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
Invicta International Airlines (UK)	Bristol 175 Britannia 305	4x Br Proteus 765	1	—	
	Bristol 175 Britannia 312	4x Br Proteus 765	1	—	
Iran National Airlines — **Iran Air** (Iran)	Airbus A300B2-201	2x GE CF6-50C	2	4	Plus 3 options
	Boeing 707-321B	4x P&W JT3D-3B	1	—	
	Boeing 707-321C	4x P&W JT3D-3B	1	—	
	Boeing 707-386C	4x P&W JT3D-3B	3	—	
	Boeing 727-186	3x P&W JT8D-7A	3	—	
	Boeing 727-286 Advanced	3x P&W JT8D-15	5	—	
	Boeing 737-286 Advanced	2x P&W JT8D-15	2	—	
	Boeing 737-286C Advanced	2x P&W JT8D-15	2	—	
	Boeing 747-186B	4x P&W JT9D-7F	1	—	
	Boeing 747-286B Combi	4x P&W JT9D-7F	1	—	
	Boeing 747-2J9F	4x P&W JT9D-7F	2	—	
	Boeing 747SP-86	4x P&W JT9D-7F	4	—	
	Fokker F-27-100	2x RR Dart 514-7	1	—	Leased
	Fokker F-27-300	2x RR Dart 514-7	2	—	Leased
Iraqi Airways (Iraq)	Boeing 707-370C	4x P&W JT3D-3B	3	—	
	Boeing 727-270 Advanced	3x P&W JT8D-17	3	—	
	Boeing 737-270C Advanced	2x P&W JT8D-15	3	—	
	Boeing 747-270C	4x P&W JT9D-7FW	2	—	
	Dassault Falcon 20F	2x GE CF700-2D-2	3	—	Leased
Iscargo (Iceland)	Lockheed L-188C	4x Asn 501-D13	1	—	
Island Air (Guam)	BAe Viscount 745D	4x RR Dart 510	—	(1)	
	Embraer EMB-110P1	2x P&WC PT6A-34	2	—	One leased
Itavia — see **Aerolinee Itavia**					
Jamaire (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	
Japan Air Lines (Japan)	Boeing 727-146	3x P&W JT8D-1	2	—	
	Boeing 747-146	4x P&W JT9D-7	3	—	
	Boeing 747-146A	4x P&W JT9D-7	4	—	
	Boeing 747-146F	4x P&W JT9D-7	1	—	
	Boeing 747-246B	4x P&W JT9D-7	18	—	
	Boeing 747-246F	4x P&W JT9D-7	4	—	
	Boeing 747SR-46	4x P&W JT9D-7	9	—	
	Douglas DC-8-53	4x P&W JT3D-3B	2	—	
	Douglas DC-8-55F	4x P&W JT3D-3B	1	—	
	Douglas DC-8-61	4x P&W JT3D-3B	12	—	
	Douglas DC-8-62	4x P&W JT3D-3B	8	—	
	Douglas DC-8-62F	4x P&W JT3D-3B	4	—	
	Douglas DC-10-40	3x P&W JT9D-59A	17	2	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Japan Asia Airway (Japan)	Douglas DC-8-53	4x P&W JT3D-3B	2	—	
	Douglas DC-8-61	4x P&W JT3D-3B	3	—	Leased
JAT — see **Jugoslovenski Aerotransport**					
Jersey European Airways (UK)	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	
	Embraer EMB-110P2	2x P&WC PT6A-34	1	—	
Jet Charter Airlines (Australia)	Cessna 500 Citation I	2x P&WC JT15D-1	1	—	Leased
	Cessna 550 Citation II	2x P&WC JT15D-4	1	—	Leased
	Gates Learjet 35	2x AiR TFE731-2-2B	2	—	Leased
	Israel Aircraft Industries 1124	2x AiR TFE731-3-1G	1	—	
	Shorts 330	2x P&WC PT6A-45	1	3	
Jugoslovenski Aerotransport — **JAT** (Yugoslavia)	Boeing 707-340C	4x P&W JT3D-3B	2	—	
	Boeing 707-351C	4x P&W JT3D-3B	2	—	
	Boeing 727-181	3x P&W JT8D-7A	2	—	Leased
	Boeing 727-2H9 Advanced	3x P&W JT8D-15	5	4	
	Boeing 727-2K5 Advanced	3x P&W JT8D-17	2	—	Leased
	Douglas DC-9-32	2x P&W JT8D-9	13	—	
	Douglas DC-10-30	3x GE CF6-50C1	2	—	
Kanaf Arkia Airlines and Aviation Services (Israel)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	2	—	
Karair (Finland)	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	Douglas DC-8-51	4x P&W JT3D-3B	1	—	
Katale Air Transport (Zaire)	Bristol 175 Britannia 252	4x Br Proteus 765	1	—	
	Bristol 175 Britannia 253	4x Br Proteus 765	2	—	
Kendell Airlines (Australia)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	2	—	
Kenn Borek Air (Canada)	Beech 99	2x P&WC PT6A-20	1	—	Leased
	Beech B99	2x P&WC PT6A-27	1	—	
	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	7	—	Four leased
Kenya Airways (Kenya)	Boeing 707-351B	4x P&W JT3D-3B	3	—	
	Boeing 720-047B	4x P&W JT3D-3B	1	—	
	Douglas DC-9-32	2x P&W JT8D-11	1	—	
	Fokker F-27-200	2x RR Dart 528-7E	2	—	
KLM — **Koninklijke Luchtvaart Maatschappij** (Netherlands)	Airbus A310-200	2x GE CF6-80A	—	10	Plus 10 options
	Boeing 747-206B	4x GE CF6-50E	3	—	Two leased
	Boeing 747-206B	4x P&W JT9D-7W	7	—	Three leased
	Boeing 747-206B Combi	4x GE CF6-50E	6	1	
	Douglas DC-8-55F	4x P&W JT3D-3B	3	—	
	Douglas DC-8-63	4x P&W JT3D-7	10	—	Four leased
	Douglas DC-9-15	2x P&W JT8D-7	2	—	
	Douglas DC-9-32	2x P&W JT8D-9	11	1	
	Douglas DC-9-33F	2x P&W JT8D-9	7	—	Two leased
	Douglas DC-10-30	3x GE CF6-50C	6	—	
KLM Helikopters (Netherlands)	MBB Bo 105D	2x Asn 250-C20B	2	—	
	Sikorsky S-61N	2x GE CT58-140	4	—	
	Sikorsky S-76A	2x Asn 250-C30	2	—	Leased
Korean Air Lines (South Korea)	Airbus A300B4-101	2x GE CF6-50C	6	—	
	Boeing 707-321B	4x P&W JT3D-3B	1	—	
	Boeing 707-3B5C	4x P&W JT3D-3B	1	—	
	Boeing 707-321C	4x P&W JT3D-3B	1	—	
	Boeing 707-338C	4x P&W JT3D-3B	2	—	
	Boeing 707-373C	4x P&W JT3D-3B	1	—	
	Boeing 727-122	3x P&W JT8D-7	2	—	
	Boeing 727-281	3x P&W JT8D-9	2	—	
	Boeing 747-2B5B	4x P&W JT9D-7AW	4	4	
	Boeing 747-230B	4x P&W JT9D-7AW	2	—	Leased
	Boeing 747-2B5F	4x P&W JT9D-7AW	2	2	
	Boeing 747-230F	4x P&W JT9D-7	1	—	Leased
	Boeing 747SP-B5	4x P&W JT9D-7AW	—	2	
	CASA C-212-5	2x AiR TPE331-5-251	1	—	
	Cessna 500 Citation I	2x P&WC JT15D-1	1	—	
	Dassault Falcon 20F	2x GE CF700-2D-2	1	—	
	Douglas DC-10-30	3x GE CF6-50C	4	—	
	Douglas DC-10-30CF	3x GE CF6-50C1	1	—	
	Fokker F-27-200	2x RR Dart 532-7	1	—	
Kuwait Airways (Kuwait)	Airbus A310-200	2x P&W JT9D-7R4D	—	11	
	Boeing 707-311C	4x P&W JT3D-7	1	—	
	Boeing 707-321C	4x P&W JT3D-3B	2	—	
	Boeing 707-369C	4x P&W JT3D-3B	5	—	
	Boeing 727-269 Advanced	3x P&W JT8D-17R	3	—	
	Boeing 747-269B Combi	4x P&W JT9D-7J	3	1	
	Grumman G-1159 Gulfstream II	2x RR Spey 511-8	2	—	
LAB — see **Lloyd Aereo Boliviano**					
Labrador Airways (Canada)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	(1)	
LAC (Colombia)	Douglas DC-8-54F	4x P&W JT3D-3B	1	(1)	
LACSA — see **Lineas Aereas Costarricenses**					
LADE — see **Lineas Aereas del Estado**					
LADECO — see **Linea Aerea del Cobre**					
LAI — see **Linea Aerea Imperial**					

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Laker Airways (UK)	Airbus A300B4-203	2x GE CF6-50C2	2	8	
	BAe One-Eleven Srs 301AG	2x RR Spey 511-14	1	—	
	BAe One-Eleven Srs 320AZ	2x RR Spey 511-14	5	—	Leased
	Boeing 707-351B	4x P&W JT3D-3B	2	—	
	Douglas DC-10-10	3x GE CF6-6D1A	6	—	Three leased
	Douglas DC-10-30	3x GE CF6-50C2B	4	—	
LAN-Chile — see **Linea Aerea Nacional**					
LANICA (Nicaragua)	Boeing 727-176	3x P&W JT8D-7	2	—	Leased
LANSA (Honduras)	Fairchild F-27J	2x RR Dart 532-7	1	—	
LAP — see **Lineas Aereas Paraguayas**					
LAPA — see **Lineas Aereas Privadas Argentinas**					
LAR — see **Linille Aeriene Romane**					
La Ronge Aviation Services (Canada)	DH Canada DHC-6-1	2x P&WC PT6A-20	1	—	Leased
	DH Canada DHC-6-100	2x P&WC PT6A-20	3	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
LAV — see **Linea Aeropostal Venezolana**					
Leeward Islands Air Transport — LIAT (Antigua)	BAe HS-748 Series 2	2x RR Dart 531-7	4	—	
	BAe HS-748 Series 2A	2x RR Dart 532-2L	2	—	
Lesotho Airways (Lesotho)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Libyan Arab Airlines (Libya)	Aerospatiale Caravelle VIR	2x RR Avon 533R	1	—	
	Aerospatiale Corvette 100	2x P&WC JT15D-4	1	—	
	Boeing 707-3L5C	4x P&W JT3D-3B	1	—	
	Boeing 707-349C	4x P&W JT3D-3B	1	—	Leased
	Boeing 727-224	3x P&W JT8D-15	1	—	
	Boeing 727-2L5 Advanced	3x P&W JT8D-15	9	—	
	Dassault Falcon 20C	2x GE CF700-2C	3	—	
	Fokker F-27-400	2x RR Dart 532-7	3	—	
	Fokker F-27-600	2x RR Dart 532-7	4	—	
	Grumman G-1159 Gulfstream II	2x RR Spey 511-8	1	—	
	Lockheed L-1329 Jetstar 8	4x P&W JT12A-8	1	—	Leased
	Lockheed L-1329 Jetstar II	4x AiR TFE731-3-1F	1	—	
Lina-Congo — Lignes Nationales Aeriennes Congolaises (Congo)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
	Fokker F-27-200	2x RR Dart 532-7	1	—	
	Fokker F-27-600	2x RR Dart 532-7	1	—	
Linea Aerea del Cobre — LADECO (Chile)	Boeing 727-116	3x P&W JT8D-7	1	—	
	Boeing 727-178	3x P&W JT8D-7	1	—	
	Boeing 727-127C	3x P&W JT8D-7	1	—	
	Boeing 737-2K6 Advanced	2x P&W JT8D-15	1	—	
	Boeing 737-200 Advanced	2x P&W JT8D-17R	—	4	
Linea Aerea Imperial — LAI (Bolivia)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	1	—	Leased
Linea Aerea Nacional — LAN-Chile (Chile)	Boeing 707-321B	4x P&W JT3D-3B	3	—	One leased
	Boeing 707-330B	4x P&W JT3D-3B	2	—	
	Boeing 707-351C	4x P&W JT3D-3B	1	—	
	Boeing 707-385C	4x P&W JT3D-3B	1	—	
	Boeing 737-216 Advanced	2x P&W JT8D-17	1	—	
	Boeing 737-252C Advanced	2x P&W JT8D-17	—	1	
	Douglas DC-10-30	3x GE CF6-50C2B	1	—	Leased
Linea Aeropostal Venezolana — LAV (Venezuela)	DH Canada DHC-6-300	2x P&WC PT6A-27	6	—	
	Douglas DC-9-31	2x P&W JT8D-17	3	—	
	Douglas DC-9-51	2x P&W JT8D-17	6	—	
	Douglas DC-9-82	2x P&W JT8D-217	—	2	
Lineas Aereas Chaquenas — Aerochaco (Argentina)	DH Canada DHC-6-200	2x P&WC PT6A-20	3	—	
	Fairchild FH-227B	2x RR Dart 532-7	2	—	
Lineas Aereas Costarricenses — LACSA (Costa Rica)	BAe One-Eleven Srs 515FB	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 518FG	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 531FS	2x RR Spey 512-14DW	2	—	
	Boeing 727-2Q6 Advanced	3x P&W JT8D-15	2	—	Leased
	Lockheed L-188C(F)	4x Asn 501-D13	2	—	
Lineas Aereas de Espana — Iberia (Spain)	Airbus A300B4-120	2x P&W JT9D-59A	1	8	
	Boeing 727-256 Advanced	3x P&W JT8D-9	37	—	
	Boeing 747-256B	4x P&W JT9D-7	3	2	Plus 1 option
	Douglas DC-8-63	4x P&W JT3D-7	4	—	
	Douglas DC-8-63F	4x P&W JT3D-7	1	—	
	Douglas DC-9-32	2x P&W JT8D-7	28	—	
	Douglas DC-9-33F	2x P&W JT8D-9	4	—	
	Douglas DC-10-30	3x GE CF6-50C	8	—	
	Fokker F-27-600	2x RR Dart 532-7	7	—	
Lineas Aereas del Caribe — see LAC (Colombia)					
Lineas Aereas del Estado — LADE (Argentina)	DH Canada DHC-6-200	2x P&WC PT6A-20	7	—	Leased
	Fokker F-27-400	2x RR Dart 532-7	5	—	Leased
	Fokker F-27-600	2x RR Dart 532-7	5	—	Leased
	Fokker F-28-1000	2x RR Spey 555-15	5	—	Leased
Lineas Aereas de Nicaragua — see LANICA (Nicaragua)					
Lineas Aereas La Urraca (Colombia)	Handley Page Herald 101	2x RR Dart 527-7	1	—	
Lineas Aereas Nacionales SA — see LANSA (Honduras)					
Lineas Aereas de Paraguayas — LAP (Paraguay)	Boeing 707-321B	4x P&W JT3D-3B	9	—	One leased
	Lockheed L-188A	4x Asn 501-D13	1	—	
	Lockheed L-188C	4x Asn 501-D13	2	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Lineas Aereas Privadas Argentinas — LAPA (Argentina)	BAe 146-100	4x AvL ALF 502-R3	—	2	
	BAe 146-200	4x AvL ALF 502-R3	—	1	Plus 3 options
	BAe One-Eleven Srs 416EK	2x RR Spey 511-14	1	—	Leased
	NAMC YS-11A-300	2x RR Dart 542-10K	2	—	
	Shorts 330	2x P&WC PT6A-45	2	—	
Linee Aeree Italiane — Alitalia (Italy)	Airbus A300B4-203	2x GE CF6-50C2	4	4	Plus 3 options
	Boeing 727-243 Advanced	3x P&W JT8D-9	14	4	
	Boeing 747-143	4x P&W JT9D-3A	1	—	
	Boeing 747-243B	4x GE CF6-50E2	—	4	
	Boeing 747-243B	4x P&W JT9D-3A	3	—	
	Boeing 747-243B Combi	4x GE CF6-50E2	3	1	
	Boeing 747-243F	4x GE CF6-50E2	—	1	
	Douglas DC-8-62	4x P&W JT3D-3B	6	—	
	Douglas DC-8-62F	4x P&W JT3D-3B	2	—	
	Douglas DC-9-32	2x P&W JT8D-9	25	—	
	Douglas DC-10-30	3x GE CF6-50C	8	—	
Linhas Aereas de Angola — TAAG (Angola)	Antonov An-26	2x Ivc AI-24T	4	—	
	Boeing 707-347C	4x P&W JT3D-3B	2	—	
	Boeing 707-349C	4x P&W JT3D-3B	2	—	
	Boeing 707-373C	4x P&W JT3D-3B	1	—	
	Boeing 737-2M2 Advanced	2x P&W JT8D-17	1	—	
	Boeing 737-2M2C Advanced	2x P&W JT8D-17	1	—	
	Fokker F-27-200	2x RR Dart 528	2	—	
	Fokker F-27-400	2x RR Dart 536-7R	1	—	
	Fokker F-27-600	2x RR Dart 536-7R	3	—	
	Lockheed L-382E	4x Asn 501-D22A	2	—	
	Yakovlev Yak-40F	3x Ivc AI-25	3	—	
Linhas Aereas de Guinee-Bissau (Guinee-Bissau)	BAe HS-748 Series 2A	2x RR Dart 532-2L	1	—	
Linhas Aereas de Mocambique — DETA (Mozambique)	Boeing 707-338C	4x P&W JT3D-3B	2	—	Leased
	Boeing 737-2B1	2x P&W JT8D-9	2	—	
	Boeing 737-2B1 Advanced	2x P&W JT8D-9	1	—	
	Boeing 737-2B1C Advanced	2x P&W JT8D-9	1	—	
	Fokker F-27-200	2x RR Dart 532-7R	2	—	
	Fokker F-27-600	2x RR Dart 532-7R	1	—	
Linhas Aereas Transbrasil (Brazil)	Boeing 727-127	3x P&W JT8D-9A	3	—	One leased
	Boeing 727-162	3x P&W JT8D-7B	1	—	
	Boeing 727-177	3x P&W JT8D-7B	2	—	Leased
	Boeing 727-178	3x P&W JT8D-7B	1	—	
	Boeing 727-191	3x P&W JT8D-9A	1	—	Leased
	Boeing 727-121C	3x P&W JT8D-7B	2	—	
	Boeing 727-127C	3x P&W JT8D-7B	6	—	One leased with -9A engines
	Boeing 727-185C	3x P&W JT8D-7A	1	—	Leased
	Boeing 757-2Q4	2x RR RB.211-535C	—	5	
	Boeing 767-2Q4	2x GE CF6-80A	—	3	
Liniile Aeriene Romane — LAR (Romania)	BAe One-Eleven Srs 424EU	2x RR Spey 511-14	3	—	
Linjeflyg (Sweden)	Fokker F-28-1000	2x RR Spey 555-15	3	—	
	Fokker F-28-4000	2x RR Spey 555-15H	10	—	
Loganair (UK)	DH Canada DHC-6-300	2x P&WC PT6A-27	9	—	
	Embraer EMB-110P1	2x P&WC PT6A-34	2	—	
	Shorts 330	2x P&WC PT6A-45A	2	—	
LOT — see Polskie Linie Lotnicze					
Lucas Air Transport (France)	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	Leased
Lufthansa — see Deutsche Lufthansa					
Lufttransport-Unternehmen — LTU (West Germany)	Lockheed L-1011-1	3x RR RB.211-22B	5	—	
	Lockheed L-1011-500	3x RR RB.211-524B3	1	1	
Luxair — Ste Luxembourgeoise de Navigation Aerienne (Luxembourg)	Boeing 707-344B	4x P&W JT3D-3B	2	—	Leased
	Boeing 737-2C9 Advanced	2x P&W JT8D-15	2	—	
	Fokker F-27-100	2x RR Dart 514-7	2	—	
	Fokker F-27-400	2x RR Dart 514-7	1	—	
MacRobertson Miller Airline Services (Australia)	Fokker F-28-1000	2x RR Spey 555-15	6	—	One leased
Maersk Air (Denmark)	BAe HS-125 Series 400B	2x RR Viper 522	1	—	
	BAe HS-748 Series 2	2x RR Dart 531-7	2	—	Leased
	Beech C90	2x P&WC PT6A-21	2	—	
	Boeing 720-051B	4x P&W JT3D-3B	4	—	
	Boeing 737-2L9 Advanced	2x P&W JT8D-17	4	3	One leased
	DH Canada DHC-7-102	4x P&WC PT6A-50	—	2	Plus 2 options
Magyar Legikozlek Vallalat — Malev (Hungary)	Ilyushin Il-18D	4x Ivc AI-20M	1	—	
	Ilyushin Il-18V	4x Ivc AI-20K	3	—	
	Tupolev Tu-134	2x Sol D-30	3	—	
	Tupolev Tu-134A	2x Sol D-30-2	2	—	
	Tupolev Tu-154	3x Kuz NK-8-2	5	—	
	Tupolev Tu-154B-2	3x Kuz NK-8-2U	3	—	
Malaysia Air Charter (Malaysia)	Nurtanio (CASA) NC-212-200	2x AiR TPE331-10-501C	—	4	
	Shorts SC-7 Skyvan Srs 3	2x AiR TPE331-201	5	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Malaysian Airline System (Malaysia)	Airbus A300B4-203	2x GE CF6-50C2	3	1	
	Boeing 707-338C	4x P&W JT3D-3B	1	—	
	Boeing 737-2H6 Advanced	2x P&W JT8D-15	8	—	
	Boeing 737-2L9 Advanced	2x P&W JT8D-15	1	—	Leased
	Boeing 737-2H6C Advanced	2x P&W JT8D-15	1	—	
	Douglas DC-10-30	3x GE CF6-50C	2	—	
	Douglas DC-10-30CF	3x GE CF6-50C2	1	—	Leased
	Fokker F-27-200	2x RR Dart 532-7	1	—	Leased
	Fokker F-27-400	2x RR Dart 532-7	1	—	Leased
	Fokker F-27-500	2x RR Dart 532-7	9	1	
	Fokker F-27-600	2x RR Dart 532-7	1	—	
Mail Airways (USA)	Beech 99	2x P&WC PT6A-20	1	—	Leased
Mandala Airlines (Indonesia)	BAe Viscount 806	4x RR Dart 510	1	—	Leased
	BAe Viscount 812	4x RR Dart 525	2	—	Leased
	BAe Viscount 816	4x RR Dart 525	1	—	Leased
	BAe Viscount 832	4x RR Dart 525	2	—	Leased
	Lockheed L-188A	4x Asn 501-D13	1	—	Leased
	Lockheed L-188C	4x Asn 501-D13	1	—	Leased
	Nurtanio (CASA) NC-212-200	2x AiR TPE331-10-501C	—	10	
Martinair Holland (Netherlands)	Airbus A310-200	2x GE CF6-80A	—	3	Plus 1 option
	Cessna 550 Citation II	2x P&WC JT15D-4	1	—	
	Douglas DC-9-32	2x P&W JT8D-9	1	—	
	Douglas DC-9-33F	2x P&W JT8D-9	2	—	
	Douglas DC-10-30CF	3x GE CF6-50C	4	—	
	Fokker F-28-1000	2x RR Spey 555-15	1	—	Leased
Masling Commuter Services (Australia)	Embraer EMB-110P2	2x P&WC PT6A-34	4	—	
Mediterranean Aviation (Malta)	CASA C-212-5	2x AiR TPE331-5-251	2	—	
Merpati Nusantara Airlines (Indonesia)	BAe HS-748 Series 2A	2x RR Dart 532-2L	2	—	
	BAe Vanguard 952	4x RR Tyne 512	1	—	Leased
	BAe Vanguard 953	4x RR Tyne 506	3	—	
	BAe Viscount 812	4x RR Dart 525F	1	—	Leased
	BAe Viscount 816	4x RR Dart 525F	1	—	Leased
	BAe Viscount 818	4x RR Dart 525F	1	—	Leased
	BAe Viscount 828	4x RR Dart 525F	2	—	
	BAe Viscount 832	4x RR Dart 525F	1	—	Leased
	Boeing 707-138B	4x P&W JT3D-3B	1	—	
	Nurtanio (CASA) NC-212-5	2x AiR TPE331-5-251	4	—	
	Nurtanio (CASA) NC-212-200	2x AiR TPE331-10-501C	2	10	
	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	16	—	
	Fokker F-27-200	2x RR Dart 532-7	4	—	
	Fokker F-27-500	2x RR Dart 532-7	—	4	
	Fokker F-27-600	2x RR Dart 532-7	4	—	
Mesaba Airlines (USA)	Beech 99	2x P&WC PT6A-20	2	—	
Metro Airlines (USA)	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	One leased
	DH Canada DHC-6-200	2x P&WC PT6A-20	8	—	Seven leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	6	—	Two leased
	Shorts 330	2x P&WC PT6A-45	5	—	Leased
Metro International Airways (USA)	Boeing 747-212B	4x P&W JT9D-7A	3	—	
Mexicana Airlines — Cia Mexicana de Aviacion (Mexico)	Boeing 727-114	3x P&W JT8D-7B	6	—	One leased with -7 engines
	Boeing 727-117	3x P&W JT8D-9A	2	—	
	Boeing 727-151	3x P&W JT8D-7	2	—	Leased
	Boeing 727-177	3x P&W JT8D-7B	1	—	Leased
	Boeing 727-264	3x P&W JT8D-17	3	—	
	Boeing 727-2J7 Advanced	3x P&W JT8D-15	4	—	Leased
	Boeing 727-2Q4 Advanced	3x P&W JT8D-17R	2	—	
	Boeing 727-264 Advanced	3x P&W JT8D-17R	27	9	Nine in service with -17 engines
	Douglas DC-10-15	3x GE CF6-50C2F	2	3	Orders have -50C2F engines
Middle East Airlines - MEA — Airliban (Lebanon)	Airbus A310-200	2x undecided	—	5	Plus 14 options
	Boeing 707-3B4C	4x P&W JT3D-3B	3	—	
	Boeing 707-347C	4x P&W JT3D-3B	2	—	
	Boeing 720-023B	4x P&W JT3D-3B	12	—	
	Boeing 720-047B	4x P&W JT3D-3B	4	—	
Mid Pacific Airlines (USA)	NAMC YS-11A-600	2x RR Dart 542-10K	2	—	
Mid-South Commuter Airlines (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	
	Embraer EMB-110P2	2x P&WC PT6A-34	1	—	Leased
Midstate Airlines (USA)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	4	—	
	Swearingen SA-226TC Metro IIA	2x AiR TPE331-3UW-303G	2	—	
	Swearingen SA-227AC Metro III	2x AiR TPE331-11U-601G	—	1	
Midway Airlines (USA)	Douglas DC-9-14	2x P&W JT8D-7	1	—	Leased
	Douglas DC-9-15	2x P&W JT8D-7	7	—	Four leased
Minerve (France)	Aerospatiale Caravelle VIN	2x RR Avon 531	2	—	
	Aerospatiale Caravelle VIR	2x RR Avon 533R	2	—	
	Aerospatiale Caravelle 10B	2x P&W JT8D-7	1	—	
	Douglas DC-8-53	4x P&W JT3D-3B	1	—	
Mississippi Valley Airlines (USA)	Beech 99	2x P&WC PT6A-20	6	—	Leased
	Fokker F-27-500	2x RR Dart 532-7	1	3	
	Shorts 330	2x P&WC PT6A-45	6	—	Four leased

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Monarch Airlines (UK)	BAe One-Eleven Srs 509EW	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 517FE	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 518FG	2x RR Spey 512-14DW	1	—	
	Boeing 720-023B	4x P&W JT3D-1-MC7	2	—	
	Boeing 720-051B	4x P&W JT3D-3B	4	—	
	Boeing 737-2K9 Advanced	2x P&W JT8D-17	2	—	Leased
	Boeing 757-200	2x RR RB.211-535C	—	2	Plus 2 options
Montana Flugbetrieb (Austria)	Boeing 707-138B	4x P&W JT3D-1-MC6	2	—	
	Boeing 707-396C	4x P&W JT3D-7	1	—	
Montauk Caribbean Airways/Ocean Reef Airways (USA)	Bell 206A	1x Asn 250-C18	1	—	
	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	Leased
Mountain West Airlines (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	4	—	Leased
Mount Cook Airlines (New Zealand)	BAe HS-748 Series 2	2x RR Dart 534-2	4	—	
Namib Air (Namibia)	Convair 580	2x Asn 501-D13D	3	—	
Nederlandse Luchtvaart Maatschappij — NLM (Netherlands)	Fokker F-27-200	2x RR Dart 532-7R	4	—	Leased
	Fokker F-27-500	2x RR Dart 532-7R	—	3	
	Fokker F-27-600	2x RR Dart 532-7R	1	—	Leased
	Fokker F-28-4000	2x RR Spey 555-15H	4	—	Leased
New Air (USA)	Embraer-EMB-110P1	2x P&WC PT6A-34	2	—	One leased
New York Air (USA)	Douglas DC-9-32	2x P&W JT8D-9A	6	2	
New York Helicopter (USA)	Aerospatiale SA-360C	1x Tbm Astazou XVIIIA	7	—	
Nigeria Airways (Nigeria)	Boeing 707-321B	4x P&W JT3D-3B	1	—	Leased
	Boeing 707-3F9C	4x P&W JT3D-3B	3	—	
	Boeing 727-2F9 Advanced	3x P&W JT8D-15	2	—	
	Boeing 727-230 Advanced	3x P&W JT8D-15	1	—	Leased
	Boeing 737-2H4	2x P&W JT8D-9A	1	—	Leased
	Boeing 737-275	2x P&W JT8D-11	1	—	Leased
	Boeing 737-281	2x P&W JT8D-9	2	—	One leased
	Boeing 737-2F9 Advanced	2x P&W JT8D-15	2	—	
	Boeing 737-275C	2x P&W JT8D-9	1	—	Leased
	Douglas DC-10-30	3x GE CF6-50C	2	—	
	Fokker F-27-400	2x RR Dart 528-7R	2	—	
	Fokker F-27-600	2x RR Dart 528-7R	2	—	
	Fokker F-28-2000	2x RR Spey 555-15	6	—	
	Fokker F-28-4000	2x RR Spey 555-15H	2	—	
Nihon Kinkyori Airways (Japan)	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	
	NAMC YS-11-100	2x RR Dart 542-10	1	—	
	NAMC YS-11A-200	2x RR Dart 543-10K	2	—	One leased
Nile Valley Aviation (Egypt)	Handley Page Herald 100	2x RR Dart 527-7	1	—	Leased
	Handley Page Herald 214	2x RR Dart 527-7	1	—	Leased
Norcanair — North Canada Air (Canada)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	2	—	One leased
	Fairchild F-27J	2x RR Dart 532-7	5	—	
Nordair (Canada)	Boeing 737-212	2x P&W JT8D-9	1	—	
	Boeing 737-2E1 Advanced	2x P&W JT8D-9	1	—	Leased
	Boeing 737-2Q8 Advanced	2x P&W JT8D-9A	1	—	
	Boeing 737-242 Advanced	2x P&W JT8D-9	3	—	
	Boeing 737-242C	2x P&W JT8D-9	3	—	
	Boeing 737-242C Advanced	2x P&W JT8D-9	1	—	
	Fairchild FH-227D	2x RR Dart 532-7L	1	—	
	Fairchild FH-227E	2x RR Dart-532-7L	2	—	
	Lockheed L-188C	4x Asn 501-D13	2	—	
Nordeste - Linhas Aereas Regionais (Brazil)	Embraer EMB-110C	2x P&WC PT6A-27	5	—	
	Embraer EMB-110P	2x P&WC PT6A-27	2	—	
	Embraer EMB-110P2	2x P&WC PT6A-34	1	—	
Nor-Fly Charter (Norway)	Convair 580	2x Asn 501-D13H	2	—	
Norfolk Island Airlines (Norfolk Is)	Beech 200	2x P&WC PT6A-41	4	—	
norOntair (Canada)	DH Canada DHC-6-300	2x P&WC PT6A-27	(9)	—	Operated by Air-Dale (4), Austin (2), On Air (3)
	DH Canada DHC-8	2x P&WC PW108A	—	2	
North Canada Air — see Norcanair					
Northern Thunderbird Air (Canada)	DH Canada DHC-6-200	2x P&WC PT6A-27	2	—	One leased
Northern Wings/Les Ailes du Nord (Canada)	BAe HS-748 Series 2A	2x RR Dart 532-2L	2	—	
	Beech 99	2x P&WC PT6A-20	2	—	
Northwest Airlines (USA)	Boeing 727-151	3x P&W JT8D-7B	4	—	
	Boeing 727-151C	3x P&W JT8D-7B	10	—	
	Boeing 727-251	3x P&W JT8D-7B	23	—	
	Boeing 727-251 Advanced	3x P&W JT8D-15	29	—	
	Boeing 747-135	4x P&W JT9D-7	2	—	
	Boeing 747-151	4x P&W JT9D-7	10	—	
	Boeing 747-251B	4x P&W JT9D-7Q	12	—	
	Boeing 747-251F	4x P&W JT9D-7Q	5	—	
	Douglas DC-10-40	3x P&W JT9D-20	22	—	
Northwest Territorial Airways (Canada)	Lockheed L-188A(F)	4x Asn 501-D13	1	—	
	Lockheed L-382G	4x Asn 501-D22A	1	—	Leased
Ocean Airways (USA)	Beech 99	2x P&WC PT6A-20	1	—	
Ocean Reef Airways — see Montauk Caribbean Airways					

Airline	Aircraft	Engines	In Service June 30, [illegible]	On Order June 30, [illegible]	Remarks
Olympic Airways (Greece)	Aerospatiale SA-319C	1x Tbm Astazou XIV	[illegible]	—	
	Airbus A300B4-103	2x GE CF6-50C	[illegible]	2	Plus 2 options
	Boeing 707-384B	4x P&W JT3D-3B	[illegible]	—	
	Boeing 707-351C	4x P&W JT3D-3B	[illegible]	—	
	Boeing 707-384C	4x P&W JT3D-3B	[illegible]	—	
	Boeing 727-284	3x P&W JT8D-9	6	—	
	Boeing 737-284 Advanced	2x P&W JT8D-9A	11	[illegible]	
	Boeing 747-284B	4x P&W JT9D-7A	[illegible]	—	
	NAMC YS-11A-200	2x RR Dart 542-10K	[illegible]	—	
	Shorts SC-7 Skyvan Srs 3	2x AiR TPE331-201	[illegible]	—	
	Shorts 330	2x P&WC PT6A-45B	[illegible]	—	
On Air (Canada)	DH Canada DHC-6-300	2x P&WC PT6A-27	[illegible]	—	Leased from norOntair
Orion Airways (UK)	Boeing 737-2Q8 Advanced	2x P&W JT8D-15	[illegible]	—	Leased
	Boeing 737-2T5 Advanced	2x P&W JT8D-15	5	[illegible]	
Overseas National Airways (USA)	Douglas DC-8-21	4x P&W JT4A-11	[illegible]	—	Leased
	Douglas DC-8-33	4x P&W JT4A-11	[illegible]	—	Leased
	Douglas DC-8-55F	4x P&W JT3D-3B	[illegible]	—	
Owen Sound Air Services (Canada)	Swearingen SA-226AT Merlin IV	2x AiR TPE331-3UW-303G	[illegible]	—	
Ozark Air Lines (USA)	Douglas DC-9-15	2x P&W JT8D-7	7	—	Two leased
	Douglas DC-9-31	2x P&W JT8D-9	19	—	
	Douglas DC-9-32	2x P&W JT8D-9	11	—	
	Douglas DC-9-33F	2x P&W JT8D-9	1	—	Leased
	Douglas DC-9-34	2x P&W JT8D-17	2	—	Leased
Pacific Alaska Airlines (USA)	Fairchild F-27F	2x RR Dart 514-7	1	—	Leased
Pacific Southwest Airlines (USA)	Boeing 727-151	3x P&W JT8D-7	1	—	Leased
	Boeing 727-214	3x P&W JT8D-7	10	—	One leased
	Boeing 727-254	3x P&W JT8D-7	6	—	Leased
	Boeing 727-2Q8 Advanced	3x P&W JT8D-7	1	—	Leased
	Boeing 727-214 Advanced	3x P&W JT8D-7	7	—	
	Douglas DC-9-81	2x P&W JT8D-209	4	16	
Pacific Western Airlines (Canada)	Boeing 727-171C	3x P&W JT8D-9	1	—	
	Boeing 737-2A9	2x P&W JT8D-9	1	—	
	Boeing 737-214	2x P&W JT8D-9	1	—	
	Boeing 737-248	2x P&W JT8D-9	1	—	Leased
	Boeing 737-275 Advanced	2x P&W JT8D-9	14	5	
	Boeing 737-2A9C	2x P&W JT8D-9	2	—	
	Boeing 737-275C Advanced	2x P&W JT8D-9	3	—	
	Boeing 767-275	2x P&W JT9D-7R4D	—	4	
	Lockheed L-382E	4x Aln 501-D22A	2	—	
	Lockheed L-382F	4x Aln 501-D22A	1	—	
	Lockheed L-382G	4x Aln 501-D22A	1	—	
Pakistan International Airlines (Pakistan)	Airbus A300B4-203	2x GE CF6-50C2	4	—	Plus 6 options
	Boeing 707-351C	4x P&W JT3D-3B	2	—	
	Boeing 707-340C	4x P&W JT3D-3B	3	—	
	Boeing 707-373C	4x P&W JT3D-3B	1	—	Leased
	Boeing 720-030B	4x P&W JT3D-3B	1	—	
	Boeing 720-040B	4x P&W JT3D-3B	1	—	
	Boeing 720-047B	4x P&W JT3D-3B	4	—	
	Boeing 747-282B	4x P&W JT9D-7A	2	—	
	Boeing 747-240B Combi	4x GE CF6-50E2	2	—	
	Douglas DC-10-30	3x GE CF6-50C	3	—	
	Fokker F-27-200	2x RR Dart 532-7	7	—	
	Fokker F-27-400	2x RR Dart 536-7R	2	—	
Pan American World Airways (USA)	Boeing 707-321B	4x P&W JT3D-3B	9	—	Four leased
	Boeing 727-121	3x P&W JT8D-1	10	—	
	Boeing 727-135	3x P&W JT8D-7B	13	—	
	Boeing 727-155	3x P&W JT8D-7B	6	—	
	Boeing 727-121C	3x P&W JT8D-1	2	—	
	Boeing 727-235	3x P&W JT8D-7B	24	—	
	Boeing 727-2D4 Advanced	3x P&W JT8D-17R	2	—	
	Boeing 727-221 Advanced	3x P&W JT8D-17R	—	8	
	Boeing 747-121	4x P&W JT9D-7A	28	—	Thirteen leased
	Boeing 747-132	4x P&W JT9D-7A	1	—	
	Boeing 747-121 Combi	4x P&W JT9D-1	3	—	
	Boeing 747-123 Combi	4x P&W JT9D-1	1	—	
	Boeing 747-221F	4x P&W JT9D-7A	2	—	
	Boeing 747SP-21	4x P&W JT9D-7A	10	—	Seven leased
	Douglas DC-10-10	3x GE CF6-6D	11	—	
	Douglas DC-10-30	3x GE CF6-50C	4	—	
	Lockheed L-1011-500	3x RR RB.211-524B	7	5	
Panama World Airways (Panama)	Boeing 707-344	4x P&W JT4A-12	1	—	Leased
Pan-Air (Australia)	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
Pars Air (Iran)	Fairchild FH-227	2x RR Dart 532-7	1	—	
	Fokker F-28-1000	2x RR Spey 555-15	1	—	Leased
	Fokker F-28-4000	2x RR Spey 555-15H	—	1	
Pelican Air Transport (UK)	Boeing 707-321C	4x P&W JT3D-3B	1	—	
	Boeing 737-204C	2x P&W JT8D-15	1	—	Leased

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Pelita Air Service (Indonesia)	Boeing 707-3M1C	4x P&W JT3D-3B	1	—	
	Fokker F-27-400	2x RR Dart 536-7R	2	—	
	Fokker F-27-600	2x RR Dart 536-7R	1	—	
	Fokker F-28-1000	2x RR Spey 555-15	4	—	
	Fokker F-28-4000	2x RR Spey 555-15H	2	—	One leased
	Lockheed L-382G	4x Asn 501-D22A	3	—	Leased
	Nurtanio (MBB) NBo 105	2x Asn 250-C20B	6	30	
	Nurtanio (CASA) NC-212-200	2x AiR TPE331-10-501C	4	12	
	Shorts SC-7 Skyliner	2x AiR TPE331-201	3	—	Leased
	Shorts SC-7 Skyvan Srs 3	2x AiR TPE331-201	9	—	Leased
Pem-Air (Canada)	Beech 99	2x P&WC PT6A-20	1	—	
Pennsylvania Airlines (USA)	Beech 99	2x P&WC PT6A-20	2	—	Leased
	Beech 99A	2x P&WC PT6A-27	3	—	Leased
	Beech B99	2x P&WC PT6A-27	1	—	Leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	Leased
	Mohawk (Nord) 298	2x P&WC PT6A-45	4	—	Leased
	Shorts 330	2x P&WC PT6A-45	3	—	Leased
People Express Airlines (USA)	Boeing 737-130	2x P&W JT8D-7	4	(10)	
Philippine Air Lines (Philippines)	Airbus A300B4-103	2x GE CF6-50C2	2	3	
	BAe One-Eleven Srs 501EX	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 516FP	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 517FE	2x RR Spey 512-14DW	2	—	
	BAe One-Eleven Srs 518FG	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 523FJ	2x RR Spey 512-14DW	1	—	
	BAe One-Eleven Srs 527FK	2x RR Spey 512-14DW	4	—	
	BAe One-Eleven Srs 534FF	2x RR Spey 512-14DW	2	—	
	BAe HS-748 Series 2A	2x RR Dart 532-2L	8	—	
	Boeing 727-2M7 Advanced	3x P&W JT8D-17R	1	—	Leased
	Boeing 747-2F6B	4x GE CF6-50E2	3	—	Leased
	Douglas DC-10-30	3x GE CF6-50C	4	—	Two leased, one w/-50C2 engines
	NAMC YS-11-100	2x RR Dart 542-10	6	—	
	NAMC YS-11A-300	2x RR Dart 542-10K	2	—	
Piedmont Airlines (USA)	Boeing 727-122	3x P&W JT8D-7B	1	—	
	Boeing 727-130	3x P&W JT8D-7B	1	—	
	Boeing 727-151	3x P&W JT8D-7B	2	—	
	Boeing 727-195	3x P&W JT8D-7B	2	—	
	Boeing 737-2H5	2x P&W JT8D-9A	2	—	
	Boeing 737-201	2x P&W JT8D-9A	12	—	
	Boeing 737-222	2x P&W JT8D-9A	5	—	One leased
	Boeing 737-247	2x P&W JT8D-9A	1	—	
	Boeing 737-281	2x P&W JT8D-9A	1	—	
	Boeing 737-2A1 Advanced	2x P&W JT8D-9A	1	—	
	Boeing 737-2Q9 Advanced	2x P&W JT8D-9A	2	—	Leased
	Boeing 737-201 Advanced	2x P&W JT8D-9A	14	13	Eight leased, plus 10 options
	NAMC YS-11A-500	2x RR Dart 542-10J	6	—	
Pilgrim Aviation and Airlines (USA)	Beech 99	2x P&WC PT6A-20	2	—	One leased
	DH Canada DHC-6-100	2x P&WC PT6A-20	6	—	
	Fokker F-27-100	2x RR Dart 514-7	2	—	
	Fokker F-27-700	2x RR Dart 514-7	1	—	
Pinehurst Airlines (USA)	NAMC YS-11A-500	2x RR Dart 542-10K	4	—	Leased
	NAMC YS-11A-600	2x RR Dart 542-10S	2	—	
Pioneer Airways (USA)	Beech 99	2x P&WC PT6A-20	3	—	Leased
	Beech 99A	2x P&WC PT6A-27	1	—	Leased
PLUNA — see **Primeras Lineas Uruguayas de Navegacion Aerea**					
Pocono Airlines (USA)	Beech 99	2x P&WC PT6A-20	1	—	
	Beech B99	2x P&WC PT6A-27	2	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	2	—	
	Swearingen SA-227AC Metro III	2x AiR TPE331-11U-601G	—	1	
Polskie Linie Lotnicze — LOT (Poland)	Antonov An-12B	4x Ivc AI-20K	1	—	
	Antonov An-24V	2x Ivc AI-24A	17	—	
	Ilyushin Il-18D	4x Ivc AI-20M	1	—	
	Ilyushin Il-18E	4x Ivc AI-20M	2	—	
	Ilyushin Il-18V	4x Ivc AI-20K	6	—	
	Ilyushin Il-62	4x Kuz NK-8-4	7	—	One leased
	Ilyushin Il-62M	4x Sol D-30KU	3	—	
	Tupolev Tu-134	2x Sol D-30	4	—	
	Tupolev Tu-134A	2x Sol D-30-2	7	—	
Polynesian Airlines (West Samoa)	BAe HS-748 Series 2A	2x RR Dart 534-2	2	—	One leased
	Boeing 737-2U9 Advanced	2x P&W JT8D-15	—	1	
	Govt Acft Factories N-22B	2x Asn 250-B17B	1	—	
Precision Airlines (USA)	Convair 600	2x RR Dart 542-4	2	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
Primeras Lineas Uruguayas de Navegacion Aerea — PLUNA (Uruguay)	BAe Viscount 769D	4x RR Dart 510	1	—	
	BAe Viscount 810	4x RR Dart 525	1	—	
	BAe Viscount 827	4x RR Dart 525	2	—	
	Boeing 727-130C	3x P&W JT8D-7	3	—	One leased
	Boeing 737-2A3 Advanced	2x P&W JT8D-9A	—	3	
	Embraer EMB-110B1	2x P&WC PT6A-27	1	—	Leased
	Embraer EMB-110C	2x P&WC PT6A-27	4	—	Leased
	Fairchild FH-227D	2x RR Dart 532-7L	2	—	Leased
	Fokker F-27-100	2x RR Dart 514-7	2	—	Leased

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Prinair (USA)	Convair 580	2x Asn 501-D13D	2	—	
Princeton Aviation (USA)	Govt Acft Factories N-24A	2x Asn 250-B17B	1	—	
Princeville Airways (USA)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	Leased
Provincetown-Boston Airline (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	5	1	
Provincial Air Services (Niugini)	Govt Acft Factories N-22B	2x Asn 250-B17B	3	—	
Ptarmigan Airways (Canada)	DH Canada DHC-2 Mk.III	1x P&WC PT6A-6	2	—	
	DH Canada DHC-6-1	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	
	Piper PA-42T	2x P&WC PT6A-41	1	—	
Publi-Air (Belgium)	Beech 99	2x P&WC PT6A-20	2	—	
	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
Puerto Rico International Airlines — see **Prinair** (USA)					
Pyramid Airlines (Egypt)	NAMC YS-11A-200	2x RR Dart 542-10J	2	—	Leased
	NAMC YS-11A-300	2x RR Dart 542-10K	1	—	Leased
Qantas Airways (Australia)	BAe HS-125 Series 3B	2x RR Viper 522	1	—	
	Boeing 747-238B	4x P&W JT9D-7A	6	—	
	Boeing 747-238B	4x P&W JT9D-7F	10	—	
	Boeing 747-238B	4x RR RB.211-524B2	2	1	Order has -524D4 engines
	Boeing 747-238B Combi	4x P&W JT9D-7F	1	—	
	Boeing 747-238B Combi	4x RR RB.211-524B2	2	—	
	Boeing 747SP-38	4x RR RB.211-524B2	1	1	
Quebecair (Canada)	BAe One-Eleven Srs 304AX	2x RR Spey 511-14	2	—	
	BAe One-Eleven Srs 402AP	2x RR Spey 511-14	1	—	
	Boeing 737-2M8 Advanced	2x P&W JT8D-9A	1	—	Leased
	Boeing 737-2Q9 Advanced	2x P&W JT8D-9A	1	—	Leased
	Boeing 737-296 Advanced	2x P&W JT8D-9A	2	1	
	Convair 580	2x Asn 501-D13D	6	—	
	Fairchild F-27	2x RR Dart 514-7	3	—	
Ransome Airlines (USA)	Aerospatiale (Nord) 262A	2x Tbm Bastan VI C-1	8	—	
	DH Canada DHC-7-102	4x P&WC PT6A-50	5	—	
	Mohawk (Nord) 298	2x P&WC PT6A-45	4	—	Leased
Redcoat Air Cargo (UK)	Bristol 175 Britannia 253F	4x Br Proteus 790	1	—	
	Canadair CL-44D-4	4x RR Tyne 515-12	1	—	
Red Sea Airlines — see **Air Djibouti**					
Reeve Aleutian Airways (USA)	Lockheed L-188A(F)	4x Asn 501-D13	1	—	
	Lockheed L-188C	4x Asn 501-D13	2	—	
	NAMC YS-11A-600	2x RR Dart 542-10K	3	—	
Republic Airlines (USA)	Boeing 727-2M7 Advanced	3x P&W JT8D-17R	7	—	
	Boeing 727-2S7 Advanced	3x P&W JT8D-17	7	—	
	Convair 580	2x Asn 501-D13D	20	—	
	Douglas DC-9-14	2x P&W JT8D-7	21	—	Five leased
	Douglas DC-9-15	2x P&W JT8D-7	8	—	
	Douglas DC-9-15F	2x P&W JT8D-7	9	—	
	Douglas DC-9-31	2x P&W JT8D-9	52	—	Nine leased
	Douglas DC-9-32	2x P&W JT8D-9	6	—	
	Douglas DC-9-32F	2x P&W JT8D-9	1	—	
	Douglas DC-9-51	2x P&W JT8D-17	28	—	Thirteen leased
	Douglas DC-9-82	2x P&W JT8D-217	4	10	
Reunion Air Service (Reunion Island)	BAe HS-748 Series 2A	2x RR Dart 544-2	1	—	Leased
Rhine-Air (Switzerland)	Aerospatiale (Nord) 262B	2x Tbm Bastan VI C-1	2	—	
	Govt Acft Factories N-24A	2x Asn 250-B17B	1	—	
Rio Airways (USA)	Beech 99A	2x P&WC PT6A-27	2	—	
	Beech 200	2x P&WC PT6A-41	2	—	One leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	10	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	8	—	One leased
	Swearingen SA-226TC Metro IIA	2x AiR TPE331-3UW-303G	2	—	
Rio-Sul, Servicos Aereos Regionais (Brazil)	Embraer EMB-110P	2x P&WC PT6A-27	8	—	
	Embraer EMB-120	2x P&WC PW102A	—	—	Four options
Rocky Mountain Airways (USA)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
	DH Canada DHC-7-102	4x P&WC PT6A-50	2	—	
Royal Air Inter (Morocco)	Fokker F-27-600	2x RR Dart 532-7R	2	—	
Royal Air Maroc (Morocco)	Aerospatiale Caravelle III	2x RR Avon 527	3	—	
	Boeing 707-331B	4x P&W JT3D-3B	1	—	Leased
	Boeing 707-351C	4x P&W JT3D-3B	2	—	
	Boeing 727-2B6	3x P&W JT8D-7	2	—	
	Boeing 727-2B6 Advanced	3x P&W JT8D-15	6	—	
	Boeing 737-2B6 Advanced	2x P&W JT8D-15	3	—	
	Boeing 747-2B6B Combi	4x P&W JT9D-7F	1	—	
Royal Brunei Airlines (Brunei)	Boeing 737-2M6 Advanced	2x P&W JT8D-15	1	—	
	Boeing 737-2M6C Advanced	2x P&W JT8D-15	1	—	
Royal Jordanian Airline — ALIA (Jordan)	Boeing 707-3D3C	4x P&W JT3D-7	1	—	
	Boeing 707-321C	4x P&W JT3D-3B	2	—	
	Boeing 707-344C	4x P&W JT3D-3B	2	—	Leased
	Boeing 707-384C	4x P&W JT3D-3B	2	—	
	Boeing 720-030B	4x P&W JT3D-3B	1	—	
	Boeing 727-2D3 Advanced	3x P&W JT8D-17	5	1	
	Boeing 747-2D3B	4x GE CF6-50E	—	1	
	Boeing 747-2D3B Combi	4x GE CF6-50E	2	—	
	Lockheed L-1011-500	3x RR RB.211-524B	—	5	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Royal Nepal Airlines (Nepal)	BAe HS-748 Series 2A	2x RR Dart 532-2L	3	—	
	Boeing 727-1F8	3x P&W JT8D-9	1	—	
	Boeing 727-116C	3x P&W JT8D-9	1	—	Leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	8	—	
	Pilatus PC-6/B2-H2	1x P&WC PT6A-27	1	—	
Royal Swazi National Airways (Swaziland)	Fokker F-28-3000	2x RR Spey 555-15	1	—	
Royale Airlines (USA)	Beech 99A	2x P&WC PT6A-27	1	—	
	Beech B99	2x P&WC PT6A-27	3	—	
	Embraer EMB-110P1	2x P&WC PT6A-34	5	—	
	Shorts 330	2x P&WC PT6A-45	1	—	Leased
Ryan Aviation (USA)	Cessna 500 Citation I	2x P&WC JT15D-1	9	—	
	Gates Learjet 25B	2x GE CJ610-6	2	—	
	Gates Learjet 35	2x AiR TFE731-2-2B	1	—	Leased
SABENA — SA Belge d'Exploitation de la Navigation Aerienne (Belgium)	Airbus A310-220	2x P&W JT9D-7R4D	—	3	Plus 3 options
	Boeing 707-329C	4x P&W JT3D-7	3	—	
	Boeing 737-229 Advanced	2x P&W JT8D-15	11	—	
	Boeing 737-229C Advanced	2x P&W JT8D-15	4	—	
	Boeing 747-129 Combi	4x P&W JT9D-7	2	—	
	Douglas DC-10-30	3x GE CF6-50	1	—	Leased
	Douglas DC-10-30CF	3x GE CF6-50C	5	—	Two with -50C2 engines
SAETA — see **Sociedad Ecuatoriana de Transportes Aereos**					
Safair Freighters (South Africa)	Lockheed L-382E	4x Asn 501-D22A	1	—	
	Lockheed L-382G	4x Asn 501-D22A	12	—	
Safe-Air (New Zealand)	Hawker-Siddeley Argosy 222	4x RR Dart 532-1	2	—	
SAHSA — see **Servicio Aereo de Honduras**					
SAN — see **Servicios Aereos Nacionales** (Ecuador)					
SANSA (Costa Rica)	CASA C-212-5	2x AiR TPE331-5-251	2	—	Leased
Sat Flug (West Germany)	Aerospatiale Caravelle 10R	2x P&W JT8D-7A	3	—	
SATA (Portugal)	BAe HS-748 Series 2A	2x RR Dart 532-2L	4	—	One leased
SATENA (Colombia)	BAe HS-748 Series 2A	2x RR Dart 532-2L	2	—	Leased
SATT (French Antilles)	Boeing 707-321B	4x P&W JT3D-7	2	—	One leased
Saudi Arabian Airlines — Saudia (Saudi Arabia)	Airbus A300B4-101	2x GE CF6-50C	2	—	Leased
	Airbus A300B4-600	2x P&W JT9D-7R4H1	—	11	
	Boeing 707-368C	4x P&W JT3D-3B	8	—	
	Boeing 737-268 Advanced	2x P&W JT8D-15	18	—	
	Boeing 737-268C Advanced	2x P&W JT8D-15	2	—	
	Boeing 747-168B	4x RR RB.211-524C2	—	9	
	Boeing 747-230B	4x P&W JT9D-7	1	—	Leased
	Boeing 747-2B4B Combi	4x P&W JT9D-7	3	—	Leased
	Boeing 747SP-68	4x RR RB.211-524B	1	1	Order has -C2 engines
	DH Canada DHC-6-300	2x P&WC PT6A-27	—	1	
	Douglas DC-8-52	4x P&W JT3D-3B	1	—	Leased
	Douglas DC-8-55	4x P&W JT3D-3B	3	—	Leased
	Douglas DC-8-61	4x P&W JT3D-3B	1	—	Leased
	Embraer EMB-110P1	2x P&WC PT6A-34	2	—	Leased
	Fokker F-28-3000	2x RR Spey 555-15H	2	1	Leased
	Grumman G-1159 Gulfstream II	2x RR Spey 511-8	5	—	
	Grumman G-1159 Gulfstream III	2x RR Spey 511-8	1	1	
	Lockheed L-1011-200	3x RR RB.211-524B	16	1	
Scanair (Sweden)	Douglas DC-8-62	4x P&W JT3D-7	2	—	Leased
	Douglas DC-8-62F	4x P&W JT3D-7	2	—	Leased
	Douglas DC-8-63	4x P&W JT3D-7	1	—	Leased
Scandinavian Airlines System — SAS (Denmark/Norway/Sweden)	Airbus A300B2-320	2x P&W JT9D-59A	3	1	Plus 6 options
	Boeing 747-283B	4x P&W JT9D-7W	2	1	
	Boeing 747-283B Combi	4x P&W JT9D-70A	3	—	
	Douglas DC-8-62	4x P&W JT8D-7	2	—	
	Douglas DC-8-63	4x P&W JT8D-7	4	—	
	Douglas DC-9-21	2x P&W JT8D-11	8	—	
	Douglas DC-9-33F	2x P&W JT8D-11	2	—	
	Douglas DC-9-41	2x P&W JT8D-11	49	—	
	Douglas DC-10-30	3x GE CF6-50C	5	—	
Scheduled Skyways (USA)	Beech 99	2x P&WC PT6A-20	2	—	
	Beech B99	2x P&WC PT6A-27	1	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	7	—	Two leased
Schreiner Airways Nederland (Netherlands)	Beech 200	2x P&WC PT6A-41	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	4	—	
Schweizerische Luftverkehr/Suisse pour la Navigation Aerienne — see **Swissair**					
Sea Airmotive — Seair (USA)	Beech E90	2x P&WC PT6A-27	1	—	
	Beech 200	2x P&WC PT6A-41	1	—	
	Convair 580	2x Asn 501-D13D	3	—	
	DH Canada DHC-2 Mk.III	1x P&WC PT6A-20	5	—	
	DH Canada DHC-6-100	2x P&WC PT6A-20	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	8	—	
Sempati Air Transport (Indonesia)	Fokker F-27-200	2x RR Dart 532-7	1	—	
	Fokker F-27-400	2x RR Dart 532-7	1	—	Leased
	Fokker F-27-600	2x RR Dart 532-7R	3	—	Leased
Servicio Aereo de Honduras SA — SAHSA (Honduras)	Boeing 737-2K6 Advanced	2x P&W JT8D-15	1	—	
	Lockheed L-188A	4x Asn 501-D13	2	—	
Servicio de Aeronavigacion a Territorios Nacionales — see **SATENA** (Colombia)					

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Servicios Aereos Nacionales SA — see SANSA (Costa Rica)					
Servicios Aereos Nacionales — SAN (Ecuador)	Aerospatiale Caravelle VIR	2x RR Avon 533R	5	—	
	BAe Viscount 786D	4x RR Dart 510	1	—	
	BAe Viscount 828	4x RR Dart 525	1	—	
Shirley Air Services (Canada)	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	
Sierra Pacific Airlines (USA)	Convair 580	2x Asn 501-D13D	3	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	One leased
Silver State Airlines (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	Leased
Simmons Airlines (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	Leased
Singapore Airlines (Singapore)	Airbus A300B4-203	2x GE CF6-50C2	3	3	Plus 3 options
	Boeing 707-327C	4x P&W JT3D-3B	1	—	
	Boeing 727-212 Advanced	3x P&W JT8D-17	7	—	
	Boeing 747-212B	4x P&W JT9D-7Q	14	1	Three with -7A engines
	Douglas DC-10-30	3x GE CF6-50C1	5	—	One with -50C2 engines
Sky West Aviation (USA)	Swearingen SA-226TC Metro II	2x AiR TPE-331-3UW-303G	3	—	Leased
Skyways Airways (UK)	Fairchild FH-227B	2x RR Dart 532-7	3	—	One leased
Skywest Airlines (Australia)	Beech 200	2x P&WC PT6A-41	3	—	Leased
	Cessna 550 Citation II	2x P&WC JT15D-4	2	—	Leased
	Embraer EMB-110P1	2x P&WC PT6A-34	1	—	Leased
	Embraer EMB-110P2	2x P&WC PT6A-34	1	—	Leased
	Govt Acft Factories N-24A	2x Asn 250-B17B	2	—	Leased
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	1	—	Leased
Sleigh Aviation, H.C. (Australia)	Govt Acft Factories N-22B	2x Asn 250-B17B	3	—	
	Govt Acft Factories N-22S	2x Asn 250-B17B	2	—	
	Govt Acft Factories N-24A	2x Asn 250-B17B	—	1	
	Rockwell Commander 690B	2x AiR TPE331-5-251K	1	—	
SLM — see Surinaamse Luchtvaart Maatschappij					
S.M.B. Stage Lines (USA)	Convair 600	2x RR Dart 542-4	9	—	
Sobelair — Societe Belge de Transports par Air (Belgium)	Boeing 707-329	4x P&W JT4A-11	1	—	
	Boeing 707-329C	4x P&W JT3D-7	1	—	
	Boeing 707-373C	4x P&W JT3D-7	1	—	Leased
	Boeing 737-229 Advanced	2x P&W JT8D-15	3	—	
Sociedad Ecuatoriana de Transportes Aereos — SAETA (Ecuador)	Aerospatiale Caravelle VIN	2x RR Avon 533R	6	—	
	BAe Viscount 745D	4x RR Dart 510	1	—	
Sociedade Acoreana de Transportes Aereos — see SATA (Portugal)					
Societe Antillaise de Transport Touristique — see SATT (French Antilles)					
Societe Tunisienne de l'Air — Tunis Air (Tunis)	Airbus A300B4-203	2x GE CF6-50C2	1	—	Plus 1 option
	Boeing 727-2H3	3x P&W JT8D-9A	1	—	
	Boeing 727-2H3 Advanced	3x P&W JT8D-9A	9	—	
	Boeing 737-2H3 Advanced	2x P&W JT8D-9A	1	2	
	Boeing 737-2H3C Advanced	2x P&W JT8D-15	1	—	
Solair — Solomon Islands Airways (Solomon Islands)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	1	—	
Somali Airlines (Somalia)	Boeing 707-338C	4x P&W JT3D-3B	2	—	
	Boeing 720-023B	4x P&W JT3D-3B	2	—	
	Fokker F-27-600	2x RR Dart 536-7R	2	—	
Soonair Lines (USA)	Swearingen SA-226TC Metro	2x AiR TPE331-3UW-303G	1	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	1	—	
South African Airways (South Africa)	Airbus A300B2-201	2x GE CF6-50C	4	—	
	Airbus A300B4-103	2x GE CF6-50C2	—	1	Plus 2 options
	Airbus A300C4-103	2x GE CF6-50C2	—	1	
	BAe HS-748 Series 2A	2x RR Dart 532-2L	3	—	
	Boeing 707-344C	4x P&W JT3D-7W	1	—	
	Boeing 727-144	3x P&W JT8D-7B	6	—	
	Boeing 727-144C	3x P&W JT8D-7B	3	—	
	Boeing 737-244	2x P&W JT8D-9	6	—	
	Boeing 737-244 Advanced	2x P&W JT8D-17R	—	12	
	Boeing 747-244B	4x P&W JT9D-7FW	5	—	
	Boeing 747-244B Combi	4x P&W JT9D-7Q	—	2	
	Boeing 747SP-44	4x P&W JT9D-7FW	6	—	
South Pacific Island Airways (Samoa)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	One leased
Southeast Airlines (USA)	Fairchild F-27	2x RR Dart 514-7	1	—	Leased
	Grumman G-159 Gulfstream I	2x RR Dart 529-8E	1	—	Leased
Southern Air Transport (USA)	Lockheed L-382E	4x Asn 501-D22A	1	—	
	Lockheed L-382F	4x Asn 501-D22A	1	—	
Southern Frontier Air Transport (Canada)	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	Leased
Southern Jersey Airways (USA)	DH Canada DHC-6-300	2x P&WC PT6A-27	5	—	
	DH Canada DHC-8	2x P&WC PW108A	—	4	
Southwest Airlines (Okinawa)	Boeing 737-2Q3 Advanced	2x P&W JT8D-17	4	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	4	—	
	NAMC YS-11A-200	2x RR Dart 542-10K	5	—	
Southwest Airlines (USA)	Boeing 737-2H4 Advanced	2x P&W JT8D-9A	23	4	
	Boeing 737-3H4 Advanced	2x G/S CFM56-3	—	10	Plus 30 options

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Spantax (Spain)	Convair 990A	4x GE CJ805-23	12	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	DH Canada DHC-7-100	4x P&WC PT6A-50	1	—	
	Douglas DC-8-61	4x P&W JT3D-3B	1	—	
	Douglas DC-8-61F	4x P&W JT3D-3B	2	—	
	Douglas DC-9-14	2x P&W JT8D-7	3	—	One leased
	Douglas DC-10-30CF	3x GE CF6-50C1	1	—	
Sterling Airways (Denmark)	Aerospatiale Caravelle 10B	2x P&W JT8D-7	4	—	Two with -9 engines
	Aerospatiale Caravelle 12	2x P&W JT8D-9	4	—	
	Aerospatiale Corvette 100	2x P&WC JT15D-4	2	—	
	Beech C90	2x P&WC PT6A-21	1	—	
	Boeing 727-2J4 Advanced	3x P&W JT8D-17	6	—	
Suburban Airlines (USA)	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	Leased
	DH Canada DHC-8	2x P&WC PW108A	—	3	
	Shorts 330	2x P&WC PT6A-45	5	—	One leased
	Shorts 360	2x P&WC PT6A-65R	—	4	
Sudan Airways (Sudan)	Boeing 707-3J8C	4x P&W JT3D-7	2	—	
	Boeing 737-2J8C Advanced	2x P&W JT8D-7	2	—	
	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	Leased
	Fokker F-27-200	2x RR Dart 532-7R	3	—	
	Fokker F-27-400	2x RR Dart 532-7R	2	—	
Summit Airlines (USA)	Convair 580	2x Asn 501-D13D	5	—	
Sun Aire Lines (USA)	Swearingen SA-226TC Metro	2x AiR TPE331-3UW-303G	1	—	Leased
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	4	—	Leased
Sunbird Airlines (USA)	Beech 99A	2x P&WC PT6A-27	1	—	
	Beech C99	2x P&WC PT6A-34	—	10	
Surinaamse Luchtvaart Maatschappij — SLM (Surinam)	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	
	Douglas DC-8-55CF	4x P&W JT3D-3B	1	—	Leased
	Douglas DC-8-63	4x P&W JT3D-7	1	—	Leased
Swedair (Sweden)	Cessna 441	2x AiR TPE331-8-401S	1	1	
	DH Canada DHC-6-300	2x P&WC PT6A-27	8	—	
	Gates Learjet 24	2x GE CJ610-4	2	—	
	Gates Learjet 35A	2x AiR TFE731-2-2B	1	—	
	Gates Learjet 36	2x AiR TFE731-2-2B	1	—	
	Mitsubishi MU-2B-20 (MU-2F)	2x AiR TPE331-1-151A	9	—	
	Saab-Fairchild 340	2x GE CT7-5	—	10	
Swift Aire Lines (USA)	Aerospatiale (Nord) 262A	2x Tbm Bastan VIC	4	—	
	Fokker F-27-500	2x RR Dart 536-7R	1	1	
	Fokker F-27-600	2x RR Dart 536-7R	3	—	Leased
Swiftair Cargo (Canada)	Douglas DC-8-33F	4x P&W JT4A-9	2	—	
Swissair — Schweizerische Luftverkehr/Suisse pour la Navigation Aerienne (Switzerland)	Airbus A310-220	2x P&W JT9D-7R4D	—	10	Plus 10 options
	Boeing 747-257B	4x P&W JT9D-7	2	—	
	Boeing 747-257B/SUD	4x P&W JT9D-7R4G2	—	3	Plus 4 options
	Boeing 747-257B/SUD Combi	4x P&W JT9D-7R4G2	—	2	
	Douglas DC-8-62	4x P&W JT3D-3B	4	—	
	Douglas DC-9-32	2x P&W JT8D-9A	11	—	Three leased
	Douglas DC-9-33F	2x P&W JT8D-9A	1	—	Leased
	Douglas DC-9-51	2x P&W JT8D-15	12	—	One leased
	Douglas DC-9-81	2x P&W JT8D-209	8	7	Plus 5 options
	Douglas DC-10-30	3x GE CF6-50C	11	—	
	Douglas DC-10-30ER	3x GE CF6-50C2B	—	2	
Syd-Aero Be-Ge (Sweden)	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	Leased
Syrian Arab Airlines (Syria)	Aerospatiale Caravelle 10B	2x P&W JT8D-7	3	—	
	Boeing 727-294 Advanced	3x P&W JT8D-17	3	—	
	Boeing 747SP-94	4x P&W JT9D-7	2	—	
	Dassault Falcon 20F	2x GE CF700-2D-2	2	—	Leased
	Ilyushin Il-76T	4x Sol D-30KP	2	—	Leased
TAAG -- see **Linhas Aereas de Angola**					
TABA — see **Transportes Aereos Regionais da Bacia Amazonica**					
TAC — see **Aerovias del Cesar**					
TACA International Airlines (El Salvador)	BAe One-Eleven Srs 407AW	2x RR Spey 511-4	2	—	
	Boeing 737-2A1 Advanced	2x P&W JT8D-17	1	—	
	Lockheed L-188A(F)	4x Asn 501-D13	1	—	
TACV — see **Transportes Aereos de Cabo Verde**					
TAE — see **Trabajos Aereos y Enlaces**					
Talair (Niugini)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	5	—	
	Embraer EMB-110P2	2x P&WC PT6A-34	2	2	
	Pilatus PC-6/B2-H2	1x P&WC PT6A-27	1	—	
TAM — see **Transportes Aereos Regionais**					
TAME — see **Transportes Aereos Nacionales Ecuatorianos**					
TAMPA — see **Transportes Aereos Mercantiles Panamericano**					
TAN — see **Transportes Aereos Nacionales** (Honduras)					
TAP — see **Air Portugal**					
TAR — see **Transporte Aereo Rioplatense**					
TAROM - see **Transporturile Aeriene Romane**					
TAVINA — see **Trans-Colombiana de Aviacion**					
Tejas Airlines (USA)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	3	—	Leased

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Tennessee Airways (USA)	Embraer EMB-110P1	2x P&WC PT6A-34	3	1	
	Embraer EMB-120	2x P&WC PW102A	—	2	
Texas International Airlines (USA)	Douglas DC-9-14	2x P&W JT8D-7A	15	—	
	Douglas DC-9-15	2x P&W JT8D-7A	1	—	
	Douglas DC-9-15F	2x P&W JT8D-7A	2	—	
	Douglas DC-9-32	2x P&W JT8D-9A	16	—	
Thai Airways (Thailand)	BAe HS-748 Series 2	2x RR Dart 531-7	7	—	
	Boeing 737-2P5 Advanced	2x P&W JT8D-15	3	—	
Thai Airways International (Thailand)	Airbus A300B4-103	2x GE CF6-50C2	8	—	
	Airbus A300B4-203	2x GE CF6-50C2	2	—	
	Airbus A300B4-602	2x GE CF6-80C1	—	2	Plus 2 options
	Boeing 747-2D7B	4x GE CF6-50E2	5	—	Plus 2 SUD options
	Douglas DC-8-62F	4x P&W JT3D-7	1	—	
	Douglas DC-8-63	4x P&W JT3D-7	3	—	
THY — see **Turk Hava Yollari**					
TigerAir (USA)	BAe HS-125 Series 400A/731	2x AiR TFE731-3R	1	—	
	BAe One-Eleven Srs 401AK	2x RR Spey 511-14	1	—	
	Boeing 707-123B	4x P&W JT3D-1-MC6	5	—	
	Boeing 707-138B	4x P&W JT3D-3B	1	—	
	Boeing 747-212B	4x P&W JT9D-7A	3	—	
	Douglas DC-10-30F	3x GE CF6-50C1	1	—	
	Gates Learjet 35	2x AiR TFE731-2-2B	1	1	Order is Model 35A
Time Air (Canada)	Convair 640	2x RR Dart 542-4	1	—	Leased
	DH Canada DHC-6-200	2x P&WC PT6A-20	2	—	Leased
	DH Canada DHC-7-102	4x P&WC PT6A-50	2	2	
	Shorts 330	2x P&WC PT6A-45	3	—	Leased
TMA — see **Trans Mediterranean Airways**					
TOA Domestic Airlines (Japan)	Airbus A300B2-203	2x GE CF6-50C2R	3	6	
	Bell 214B	1x AvL T5508D	3	—	
	Douglas DC-9-41	2x P&W JT8D-15	21	—	
	Douglas DC-9-81	2x P&W JT8D-209	3	5	
	Fuji (Bell) 204B	1x KHI KT5311A	3	—	One with AvL T53-K-11A engine
	Fuji (Bell) 204B-2	1x KHI KT5313B	1	—	
	Hughes 369HS	1x Asn 250-C18A	2	—	
	Kawasaki (Hughes) 369D	1x Asn 250-C18A	3	—	One with -C20 engine
	NAMC YS-11-100	2x RR Dart 542-10	17	—	
	NAMC YS-11A-200	2x RR Dart 542-10	19	—	Four leased
	NAMC YS-11A-300	2x RR Dart 542-10	2	—	Leased
	NAMC YS-11A-600	2x RR Dart 542-10	3	—	
Toronto Airways (Canada)	Beech 99A	2x P&WC PT6A-27	2	—	
	Mitsubishi MU-2B-35 (MU-2J)	2x AiR TPE331-6-251M	1	—	
Touraine Air Transport (France)	Beech 65-90	2x P&WC PT6A-6	1	—	
	Beech E90	2x P&WC PT6A-28	1	—	
	Beech 99	2x P&WC PT6A-20	2	—	
	Fairchild F-27A	2x RR Dart 528-7E	1	—	
	Fairchild F-27J	2x RR Dart 532-7	2	—	
	Fairchild FH-227B	2x RR Dart 532-7	18	—	One cargo version
	Fairchild FH-227E	2x RR Dart 532-2L	1	—	
	Fokker F-27-400	2x RR Dart 532-7	1	—	
	Fokker F-27-600	2x RR Dart 532-7	1	—	
	Fokker F-28-1000	2x RR Spey 555-15	4	—	
	Rockwell Commander 690B	2x AiR TPE331-5-251K	4	—	Two with -252K engines
Trabajos Aereos y Enlaces — TAE (Spain)	Aerospatiale Caravelle 10B	2x P&W JT8D-7	3	—	
	Douglas DC-8-33	4x P&W JT4A-11	2	—	
Trabajos y Fe Transportes Aereos — see **TRAFE** (Argentina)					
Tradewinds Airways (UK)	Boeing 707-323C	4x P&W JT3D-3B	3	—	One leased
TRAFE (Argentina)	Douglas DC-8-33	4x P&W JT4A-9	1	—	
TransAdria (Yugoslavia)	Piper PA-31T	2x P&WC PT6A-28	1	—	
	Swearingen SA-226AT Merlin IV	2x AiR TPE331-3UW-303G	2	—	
	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	3	—	
Transair Sweden (Sweden)	Boeing 727-031C	3x P&W JT8D-7	1	—	
	Boeing 727-134	3x P&W JT8D-7	2	—	
	Boeing 727-134C	3x P&W JT8D-7	1	—	
Transamerica Airlines (USA)	Boeing 747-271C	4x GE CF6-50E	2	3	
	Douglas DC-8-63F	4x P&W JT3D-7	9	—	Two leased
	Douglas DC-10-30F	3x GE CF6-50C	3	—	
	Lockheed L-188C	4x Asn 501-D13	8	—	
	Lockheed L-382G	4x Asn 501-D22A	12	—	
Trans Australia Airlines — TAA (Australia)	Airbus A300B4-103	2x GE CF6-50C2	—	5	Plus 2 options
	Boeing 727-276 Advanced	3x P&W JT8D-15	12	—	
	Douglas DC-9-31	2x P&W JT8D-7B	12	—	
	Fokker F-27-200	2x RR Dart 532-7	2	—	
	Fokker F-27-600	2x RR Dart 532-7	8	—	
Transavia Holland (Netherlands)	Boeing 707-123B	4x P&W JT3D-1-MC7	1	—	
	Boeing 737-2K2 Advanced	2x P&W JT8D-15	3	—	One leased
	Boeing 737-2K2C Advanced	2x P&W JT8D-17R	1	—	
Transbrasil — see **Linhas Aereas Transbrasil**					
Trans Central Airlines (USA)	Swearingen SA-226TC Metro II	2x AiR TPE331-3UW-303G	4	—	Leased
Trans-Colombiana de Aviacion — TAVINA (Colombia)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	2	
	Embraer EMB-110P1	2x P&WC PT6A-34	—	2	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Trans European Airways (Belgium)	Airbus A300B1	2x GE CF6-50C	1	—	Leased
	Boeing 707-131	4x P&W JT3C-6	2	—	
	Boeing 737-2M8 Advanced	2x P&W JT8D-15	3	1	
	Boeing 737-2Q8 Advanced	2x P&W JT8D-9A	1	—	Leased
	Boeing 737-2Q9 Advanced	2x P&W JT8D-9A	1	—	Leased
Transkei Airways (South Africa)	BAe HS-748 Series 2A	2x RR Dart 536	1	—	
Trans Mediterranean Airways — TMA (Lebanon)	Boeing 707-321C	4x P&W JT3D-3B	2	—	
	Boeing 707-323C	4x P&W JT3D-3B	2	—	
	Boeing 707-327C	4x P&W JT3D-3B	5	—	
	Boeing 707-331C	4x P&W JT3D-3B	2	—	
Trans-Micronesian Airways (Guam)	Govt Acft Factories N-24A	2x Asn 250-B17B	3	—	Leased
Transna (Indonesia)	Fairchild F-27A	2x RR Dart 514-7	1	—	
Trans-North Turbo-Air (Canada)	DH Canada DHC-6-200	2x P&WC PT6A-20	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	DH Canada DHC-8	2x P&WC PW108A	—	2	
Trans Nusantara Airways — see Transna (Indonesia)					
Transporte Aereo Rioplatense — TAR (Argentina)	Boeing 707-321C	4x P&W JT3D-3B	1	—	Leased
	Boeing 707-338C	4x P&W JT3D-3B	1	—	Leased
	Canadair CL-44D4-6	4x RR Tyne 515-12	1	—	
Transportes Aereos Regionais da Bacia Amazonica — TABA (Brazil)	Embraer EMB-110P	2x P&WC PT6A-27	9	—	
	Embraer EMB-110P2	2x P&WC PT6A-34	2	—	
	Fairchild FH-227B	2x RR Dart 532-7	4	—	
Transportes Aereos de Cabo Verde — TACV (Cape Verde Islands)	BAe HS-748 Series 2A	2x RR Dart 534-2	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Transportes Aereos de Sao Tome (Sao Tome)	Fairchild F-27A	2x RR Dart 528-7	1	—	
Transportes Aereos Mercantiles Panamericano—TAMPA (Colombia)	Boeing 707-321	4x P&W JT4A-12	1	—	Leased
	Boeing 707-373C	4x P&W JT3D-3B	2	—	Leased
Transportes Aereos Nacionales — TAN (Honduras)	Boeing 737-2A3	2x P&W JT8D-9	1	—	
	Boeing 737-248	2x P&W JT8D-9A	1	—	Leased
	Lockheed L-188A	4x Asn 501-D13	1	—	
	Lockheed L-188C(F)	4x Asn 501-D13	1	—	
Transportes Aereos Nacionales Ecuatorianos — TAME (Ecuador)	BAe HS-748 Series 2A	2x RR Dart 532-2L	2	—	Leased
	Boeing 727-2T3 Advanced	2x P&W JT8D-17	1	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	3	—	Leased
	Lockheed L-188C	4x Asn 501-D13	4	—	
Transportes Aereos Regionais — TAM (Brazil)	Embraer EMB-110C	2x P&WC PT6A-27	9	—	
	Embraer EMB-110E(J)	2x P&WC PT6A-27	1	—	
	Fokker F-27-600	2x RR Dart 536-7R	3	—	
Transportes Aereos y Terrestres (Mexico)	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
Transporturile Aeriene Romane — TAROM (Romania)	Antonov An-24V	2x Ivc AI-24A	25	—	
	Antonov An-26	2x Ivc AI-24T	1	—	
	BAe One-Eleven Srs 424EU	2x RR Spey 511-14	2	—	
	BAe One-Eleven Srs 487GK	2x RR Spey 512-14DW	—	1	
	BAe One-Eleven Srs 525FT	2x RR Spey 512-14DW	6	1	
	Boeing 707-3K1C	4x P&W JT3D-7	4	—	
	Boeing 707-321C	4x P&W JT3D-7	2	—	
	Ilyushin Il-18B	4x Ivc AI-20	8	—	
	Ilyushin Il-18D	4x Ivc AI-20M	4	—	
	Ilyushin Il-62	4x Kuz NK-8-4	3	—	
	Ilyushin Il-62M	4x Sol D-30KU	1	—	
	Tupolev Tu-154	2x Kuz NK-8-2	6	—	
	Tupolev Tu-154B-1	3x Kuz NK-8-2U	2	—	
	Tupolev Tu-154B-2	3x Kuz NK-8-2U	2	—	
Trans West Airlines (Australia)	Beech 200	2x P&WC PT6A-41	1	—	
	Beech 200C	2x P&WC PT6A-41	2	—	
	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Trans World Airlines (USA)	Boeing 707-131B	4x P&W JT3D-3B	39	—	Two leased
	Boeing 707-331B	4x P&W JT3D-3B	30	—	Nine leased
	Boeing 707-331C	4x P&W JT3D-3B	1	—	
	Boeing 727-131	3x P&W JT8D-1	26	—	
	Boeing 727-231	3x P&W JT8D-9	36	—	Twenty-nine leased
	Boeing 727-231 Advanced	3x P&W JT8D-9	10	—	One leased
	Boeing 727-231 Advanced	3x P&W JT8D-15	10	—	
	Boeing 727-131C	3x P&W JT8D-1	6	—	
	Boeing 727-180C	3x P&W JT8D-1	2	—	Leased
	Boeing 747-131	4x P&W JT9D-3A	11	—	Ten leased
	Boeing 747-156	4x P&W JT9D-7	2	—	
	Boeing 747SP-31	4x P&W JT9D-7A	3	—	
	Boeing 767-231	2x P&W JT9D-7R4D	—	10	
	Lockheed L-1011-1	3x RR RB.211-22B	22	—	Eight leased
	Lockheed L-1011-100	3x RR RB.211-22B	5	2	
	Lockheed L-1011-200	3x RR RB.211-524	1	—	
Trinidad & Tobago (BWIA International) Airways (West Indies)	BAe HS-748 Series 2A	2x RR Dart 532-2L	6	—	
	Boeing 707-321B	4x P&W JT3D-3B	2	—	
	Boeing 707-351C	4x P&W JT3D-3B	3	—	
	Douglas DC-9-34CF	2x P&W JT8D-17	1	—	
	Douglas DC-9-51	2x P&W JT8D-17	4	—	
	Lockheed L-1011-500	3x RR RB.211-524B	2	2	
Tunis Air — see Societe Tunisienne de l'Air					

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Tunis-Avia (Tunis)	BAe HS-748 Series 2A	2x RR Dart 532-2L	1	—	Leased
	DH Canada DHC-6-300	2x P&WC PT6A-27	1	—	
	Fokker F-27-400	2x RR Dart 532-7	1	—	Leased
Turk Hava Yollari — THY (Turkey)	Boeing 707-321B	4x P&W JT3D-3B	2	—	
	Boeing 707-321B(F)	4x P&W JT3D-3B	1	—	
	Boeing 727-2F2 Advanced	3x P&W JT8D-15	5	—	
	Douglas DC-9-32	2x P&W JT8D-9	9	—	
	Douglas DC-10-10	3x GE CF6-6D	2	—	
	Fokker F-28-1000	2x RR Spey 555-15	2	—	
Tyrolean Airways (Austria)	Aerospatiale SA-315B	1x Tbm Artouste IIIB	2	—	
	Aerospatiale AS-332C	2x Tbm Makila IA	1	—	
	Aerospatiale AS-355F	2x Asn 250-C20F	—	1	
	Cessna 500 Citation I	2x P&WC JT15D-1	1	—	
	Cessna 550 Citation II	2x P&WC JT15D-4	2	—	
	DH Canada DHC-7-102	4x P&WC PT6A-50	2	—	
Uganda Airlines (Uganda)	Boeing 707-321C	4x P&W JT3D-3B	1	—	
	Boeing 707-351C	4x P&W JT3D-3B	1	—	
	DH Canada DHC-6-200	2x P&WC PT6A-20	2	—	
	Fokker F-27-600	2x RR Dart 532-7	1	—	
	Grumman G-1159 Gulfstream II	2x RR Spey 511-8	1	—	
	Lockheed L-382G	4x Asn 501-D22A	1	—	
Uni-Air International (France)	Aerospatiale Corvette 100	2x P&WC JT15D-4	2	—	One leased
	Fokker F-27-100	2x RR Dart 514-7	4	—	Three leased
	Gates Learjet 24B	2x GE CJ610-6	2	—	One leased
	Gates Learjet 35A	2x AiR TFE731-2-2B	2	—	Leased
Union de Transports Aeriens — UTA (France)	Boeing 747-2B3B Combi	4x GE CF6-50E2	2	—	
	Boeing 747-2B3F	4x GE CF6-50E2	2	—	
	Douglas DC-8-55F	4x P&W JT3D-3B	3	—	One leased
	Douglas DC-8-62	4x P&W JT3D-3B	3	—	
	Douglas DC-8-63	4x P&W JT3D-7	2	—	One leased
	Douglas DC-8-63F	4x P&W JT3D-7	1	—	
	Douglas DC-10-30	3x GE CF6-50C	6	—	Three leased
	Fairchild F-27A	2x RR Dart 514-7	2	—	Leased
United African Airlines (Libya)	Boeing 707-123B	4x P&W JT3D-1-MC7	1	—	
	Canadair CL-44D4-1	4x RR Tyne 515-12	1	—	
	Canadair CL-44J	4x RR Tyne 515-10	1	—	
	Douglas DC-8-21	4x P&W JT4A-9	1	—	
	Douglas DC-8-33	4x P&W JT4A-11	1	—	
	Lockheed L-382G	4x Asn 501-D22A	1	—	
United Airlines (USA)	Boeing 727-122	3x P&W JT8D-7A	59	—	Twelve leased
	Boeing 727-222	3x P&W JT8D-7A	28	—	Three leased
	Boeing 727-222 Advanced	3x P&W JT8D-15	76	—	Sixteen leased
	Boeing 727-122C	3x P&W JT8D-7B	1	—	
	Boeing 737-222	2x P&W JT8D-7A	49	—	
	Boeing 747-122	4x P&W JT9D-3	18	—	Nine leased
	Boeing 767-222	2x P&W JT9D-7R	—	30	
	Douglas DC-8-54F	4x P&W JT3D-3B	14	—	
	Douglas DC-8-61	4x P&W JT3D-3B	30	—	Six leased
	Douglas DC-10-10	3x GE CF6-6D	46	1	Ten leased
USAir (USA)	BAe One-Eleven Srs 203AE	2x RR Spey 506-14	10	—	
	BAe One-Eleven Srs 204AF	2x RR Spey 506-14	15	—	
	BAe One-Eleven Srs 215AU	2x RR Spey 506-14	3	—	
	Boeing 727-122	3x P&W JT8D-7	10	—	
	Boeing 727-122C	3x P&W JT8D-7	1	—	
	Boeing 727-2B7 Advanced	3x P&W JT8D-17	3	2	
	Boeing 737-2B7 Advanced	2x P&W JT8D-15A	—	15	Plus 5 options
	Boeing 737-3B7	2x G/S CFM56-3	—	10	Plus 10 options
	Douglas DC-9-31	2x P&W JT8D-7A	52	16	Nineteen leased
	Douglas DC-9-32	2x P&W JT8D-7A	3	—	
VARIG — see **Viacao Aerea Rio Grandense**					
VASP — see **Viacao Aerea San Paulo**					
Venezolana Internacional de Aviacion SA — VIASA (Venezuela)	Boeing 747-245F	4x P&W JT9D-7A	1	—	Leased
	Douglas DC-8-53	4x P&W JT3D-3B	1	—	
	Douglas DC-8-63	4x P&W JT3D-7	2	—	
	Douglas DC-10-30	3x GE CF6-50C	6	—	
Viacao Aerea Rio Grandense — VARIG (Brazil)	Airbus A300B4-203	2x GE CF6-50C2	—	2	
	Boeing 707-320C	4x P&W JT3D-3B	1	—	
	Boeing 707-323C	4x P&W JT3D-3B	1	—	
	Boeing 707-324C	4x P&W JT3D-3B	5	—	
	Boeing 707-341C	4x P&W JT3D-3B	2	—	
	Boeing 707-345C	4x P&W JT3D-3B	2	—	
	Boeing 707-379C	4x P&W JT3D-3B	1	—	
	Boeing 707-385C	4x P&W JT3D-3B	1	—	
	Boeing 727-141	3x P&W JT8D-9	4	—	
	Boeing 727-195	3x P&W JT8D-7	3	—	
	Boeing 727-130C	3x P&W JT8D-7	1	—	
	Boeing 727-172C	3x P&W JT8D-9	1	—	
	Boeing 727-173C	3x P&W JT8D-7	2	—	
	Boeing 737-241 Advanced	2x P&W JT8D-17	10	—	
	Boeing 747-2L5B	4x GE CF6-50E2	3	—	
	Douglas DC-10-30	3x GE CF6-50C2	10	—	Four with -C engines
	Lockheed L-188A	4x Asn 501-D13	10	—	
	Lockheed L-188C(F)	4x Asn 501-D13	2	—	

Airline	Aircraft	Engines	In Service June 30, 1981	On Order June 30, 1981	Remarks
Viacao Aerea Sao Paulo — VASP (Brazil)	Airbus A300B2-203	2x GE CF6-50C2	—	3	
	Boeing 727-2A1 Advanced	3x P&W JT8D-17	6	—	
	Boeing 727-212 Advanced	3x P&W JT8D-17	2	—	Leased
	Boeing 737-2A1	2x P&W JT8D-7A	4	—	
	Boeing 737-214	2x P&W JT8D-7A	4	—	
	Boeing 737-2A1 Advanced	2x P&W JT8D-17	10	—	
	Boeing 737-2H4C	2x P&W JT8D-7A	1	—	
	Boeing 737-2A1C Advanced	2x P&W JT8D-17	2	—	
VIASA — see **Venezolana Internacional de Aviacion SA**					
Viking International Airlines (USA)	Convair 600	2x RR Dart 542-4	2	—	
Votec — Servicios Aereos Regionais (Brazil)	Aerospatiale SA-330	2x Tbm Turmo IVC	2	—	Leased
	Embraer EMB-110P	2x P&WC PT6A-27	6	—	
	Hughes 369D	1x Asn 250-C20B	5	—	Leased
	Hughes 369HS	1x Asn 250-C20	14	—	Five with -C18 engines
	Sikorsky S-58ET	1x P&WC PT6T-6	3	—	
	Sikorsky S-61N	2x GE CT58-140-1	3	—	
	Sikorsky S-76A	2x Asn 250-C30	4	—	
Votec — Taxi Aereo Sagres (Brazil)	Embraer EMB-110C	2x P&WC PT6A-27	3	—	
	Embraer EMB-110E(J)	2x P&WC PT6A-27	1	—	Leased
Walker's Cay Airlines (USA)	DH Canada DHC-6-100	2x P&WC PT6A-20	1	—	
Wardair International (Canada)	Airbus A310-200	2x undecided	—	6	Plus 6 options
	Boeing 747-1D1	4x P&W JT9D-7	1	—	
	Boeing 747-124	4x P&W JT9D-7	1	—	
	Boeing 747-211B	4x GE CF6-50E1	2	—	
	Douglas DC-10-30	3x GE CF6-50C1	2	—	
Western Airlines (USA)	Boeing 727-247	3x P&W JT8D-9	6	—	Leased
	Boeing 727-2Q8 Advanced	3x P&W JT8D-9	1	—	Leased
	Boeing 727-247 Advanced	3x P&W JT8D-9	37	3	Five leased
	Boeing 737-247	2x P&W JT8D-9	12	—	
	Boeing 767-247	2x P&W JT9D-7R4D	—	6	
	Douglas DC-10-10	3x GE CF6-6D	12	—	Three leased
Wheeler Airlines (USA)	Beech 99	2x P&WC PT6A-20	2	—	
	Fokker F-27	2x RR Dart 514-7	1	—	Leased
White River Air Services — see **Austin Airways**					
Wideroe's Flyveselskap (Norway)	DH Canada DHC-6-300	2x P&WC PT6A-27	16	—	
	DH Canada DHC-7-102	4x P&WC PT6A-50	2	1	
	DH Canada DHC-8	2x P&WC PW108A	—	6	
Wien Air Alaska (USA)	Boeing 737-222	2x P&W JT8D-7A	2	—	Leased
	Boeing 737-210 Advanced	2x P&W JT8D-17	1	—	
	Boeing 737-291 Advanced	2x P&W JT8D-9	1	—	Leased
	Boeing 737-202C	2x P&W JT8D-17	1	—	
	Boeing 737-210C	2x P&W JT8D-17	3	—	One leased
	Boeing 737-210C Advanced	2x P&W JT8D-17	4	—	
Windward Islands Airways International (Netherlands Antilles)	DH Canada DHC-6-300	2x P&WC PT6A-27	2	—	
Wirtschaftsflug Rhein-Main (West Germany)	Beech 200	2x P&WC PT6A-41	1	—	
	Fairchild F-27J	2x RR Dart 532-7	1	—	
	Lockheed L-382	4x Asn 501-D22A	—	1	
World Airways (USA)	Boeing 747-124F	4x P&W JT9D-7A	1	—	
	Boeing 747-273C	4x P&W JT9D-7A	3	—	Two leased
	Douglas DC-8-63F	4x P&W JT3D-7	4	—	Three leased
	Douglas DC-10-30CF	3x GE CF6-50C2	8	—	Four leased
Wright Air Lines (USA)	Convair 600	2x RR Dart 542-4	4	—	
Yemen Airways — Yemenia (Yemen)	Boeing 727-2N8 Advanced	3x P&W JT8D-17R	5	—	
	Boeing 737-2N8 Advanced	2x P&W JT8D-15	1	—	
	DH Canada DHC-7-102	4x P&WC PT6A-50	2	—	
Zaire Aero Service (Zaire)	BAe Viscount 757	4x RR Dart 510	5	—	
	Boeing 707-458	4x RR Conway 508	1	—	
	Fokker F-27-200	2x RR Dart 532-7	3	—	
Zambia Airways (Zambia)	BAe HS-748 Series 2A	2x RR Dart 532-2L	3	—	
	Boeing 707-321C	4x P&W JT3D-3B	1	—	
	Boeing 707-338C	4x P&W JT3D-3B	1	—	
	Boeing 707-349C	4x P&W JT3D-3B	1	—	
	Boeing 707-351C	4x P&W JT3D-3B	1	—	
	Boeing 737-2M9 Advanced	2x P&W JT8D-17	1	—	
Zantop Airways (USA)	Grumman G-159 Gulfstream I	2x RR Dart 529-8E	7	—	Four leased
Zantop International (USA)	Convair 640(F)	2x RR Dart 532-4	14	—	Seven leased
	Douglas DC-8-21F	4x P&W JT4A-11	1	—	Leased
	Douglas DC-8-33	4x P&W JT4A-9	2	—	
	Douglas DC-8-33F	4x P&W JT4A-9	4	—	Two leased
	Douglas DC-8-54F	4x P&W JT3D-3B	1	—	
	Lockheed L-188A(F)	4x Asn 501-D13A	19	—	Three leased
	Lockheed L-188C(F)	4x Asn 501-D13A	6	—	One leased

GLOSSARY

Aero/BAe	Aerospatiale/British Aerospace
AiR	Garrett-AiResearch
Asn	Allison
AvL	Avco-Lycoming
BAe	British Aerospace
Br	Bristol
CASA	Construcciones Aeronauticas SA
CFM	General Electric/SNECMA
Combi	Passenger/freight model
DH Canada	de Havilland Aircraft of Canada
GAF	Government Aircraft Factories (Australia)
GE	General Electric
G/S	General Electric/SNECMA
Ivc	Ivchenko
KHI	Kawasaki Heavy Industries
Kuz	Kuznetsov
Let	Let National Corp. (Czechoslovakia)
Lot	Lotarev
MBB	Messerschmitt-Bolkow-Blohm
NAMC	Nihon Airplane Manufacturing Co.
P&W	Pratt & Whitney
P&WC	Pratt & Whitney of Canada
RR	Rolls-Royce
R/S	Rolls-Royce/SNECMA
SCD	Side Cargo Door
SNECMA	Societe Nationale d'Etude et de Construction de Moteurs d'Aviation
Sol	Soloviev
Srs	Series
SUD	Stretched Upper Deck
Thm	Turbomeca
VFW	Vereinigte Flugtechnische Werke

Mr. ADAMSON. When we go to the new larger 30–50 passenger type aircraft, however, we have a very different situation. It seems that only foreign manufacturers with a lot of government help are interested in taking on the task of certifying a new aircraft in this category. Air Midwest has ordered five 34 passenger Fairchild-Saab 340's for delivery in 1984 and 1985. Fairchild wings and stabilizers, and General Electric engines make it the closest thing to an American-made aircraft in that class. The rest of the aircraft is built in Sweden.

It seems that foreign manufacturers that are competing in this market receive a great deal more economic support from their governments in the development, and eventually, financing of the sales of their new aircraft. Our Government guarantees loans to purchase not only U.S. aircraft but foreign aircraft as well. Here in America we spend a great deal of money financing research at NASA and have developed a great deal of new technology. We then leave it up to the industry to risk their capital building and certifying a new aircraft to FAA regulations that would test the courage of the bravest entrepreneur.

In short, we take the first step in developing the technology and we take the third step in guaranteeing equipment loans and subsidizing the using carriers. The second step, which is the financing of the development and certification of new technology aircraft has gone to our friends in foreign lands.

It seems to me that if the financial risks were reduced or eliminated, if its not too late, our U.S. manufacturers could get into the market. Air Midwest would like to purchase and fly American airplanes. But in that category, there just aren't any available.

That is all I have to say about equipment, but I would like to take this opportunity to commend the FAA for a super job in maintaining our air traffic control system since the PATCO walkout. Air Midwest has had little, if any difficulty, in completing flights as scheduled. Our biggest difficulty is regaining the confidence of the traveling public and it seems that is coming around now, too. So I just want to commend the good American people who stayed on the job.

I would also like to take this opportunity to plead the case for joint fares after the CAB's sunset. We feel that it is going to be very difficult to keep the short haul traveler interested in flying the first leg of his connecting flight if he is not receiving the discount that he is required to receive under today's mandatory joint fares.

That is it. Thank you.

Mr. GLICKMAN. Thank you, Gary.

Mr. Stephen, it's a pleasure to have you here.

Mr. **Stephen**. Thank you, Madam Chairman, Mr. Chairman.

I would like to ask that my statement be made a part of the record. I will summarize briefly.

Mr. **Glickman**. Sure.

Mr. **Stephen**. I am Alan R. Stephen, vice president of operations for the Commuter Airlines Association of America. On behalf of the CAAA members, I am certainly pleased to come to Wichita. I have been here many times in dealing with the manufacturers that have made it the "airplane capital" of the world.

Before providing our views on the trade and technology issues of specific interest to the subcommittees, I want to report what effect the events of the past 4 weeks has had on the commuter airline industry. It is already evident that the illegal and unfortunate PATCO strike has had a profound impact on commuters.

First, commuter traffic, the average number of passengers carried daily, is down 20 percent from comparable traffic levels of a year ago. We believe this will continue to be a chronic problem for the airline industry as potential air passengers not only have concern for safety, but find former interline connections inconvenient or nonexistent.

For commuters, this is a particularly acute problem. Under the flow control procedures imposed by the FAA to balance user demand with the available system capacity, all air carriers, commuters as well as trunks, have been required to cut service by approximately 50 percent during peak travel hours at the 22 largest and most important air traffic hubs. Service frequency has long been the strategic basis for commuter scheduling. Without frequency and the concomitant well-timed connections it affords commuter passengers, many air travelers will find it more convenient to use alternative ground transportation modes, particularly the automobile, over the short distances commuters serve. Recapturing these passengers poses a marketing challenge to the commuters.

Second, the absolute capacity restrictions imposed by FAA to control air traffic does not provide for replacement air services. One of the major successes of airline deregulation has been the fact that commuter airlines have maintained air transportation to communities that otherwise would have lost all or most such service as a result of the scaleback of markets that are no longer economic for the trunk and local service airlines. Since enactment of airline deregulation 3 years ago, some 200 communities that formerly received certificated air services now are exclusively served by commuters.

In addition, commuters have maintained the only scheduled air service at another 350 points.

The capacity restrictions imposed by the FAA flow control plan will prohibit carriers from adding flights into the 22 busiest air traffic hubs probably for the next 6 to 9 months, except in those few instances where a limited amount of extra ATC capacity exists that can be allocated to new service. The result is that new replacement service will be precluded unless the replacing carrier trades off some of its existing flights in order to provide new service to a market.

This flow control restriction has already created some problems for the small and nonhub air service still being performed by the trunk and local service air carriers. Many of these communities have sustained major cuts, even the temporary loss of air service, as the incumbent trunk or local service carrier has curtailed operations to comply with the FAA capacity control plan. Where commuters remain the only class of service in these communities, passenger loads have increased dramatically. Although commuters cannot increase flight frequencies to accommodate this demand, this is the one bright spot in an otherwise depressed short-term market outlook for commuters.

Third, interline connections—the fundamental business of commuter airlines—after 3 weeks of confusion, are finally beginning to stabilize. This schedule stability, we believe, is a fundamental step to the restoration of broad public confidence in the ability to travel by air, particularly where passengers must interline with other airline flights.

Fourth, the strike has badly weakened the financial condition of the commuter airline industry. Many commuter airlines are reporting they are operating below break-even loads, although traffic has improved somewhat as the public has regained confidence in air travel. These losses, however, are occurring during the peak travel season for commuters, depleting cash reserves normally used to cushion the lean winter months.

Finally, despite the economic hardship commuter airlines have suffered as a result of the strike, the entire industry is united in its support of the administration's handling of the issue. Earlier this week, representatives from 100 commuter airlines met in Washington to review the FAA's operating plan. Without exception, these executives have reported that the FAA is maintaining an operationally safe and a reliable air traffic control system. Absolutely nobody I have talked to in the past 4 weeks, and I talk to our member airlines regularly, has identified any reason to question the reliability of this system.

Our great concern remains the lack of public confidence. We have to get a message to the traveling public that air travel continues to be safe, convenient, and reliable.

Despite the setback to the aviation system this strike has brought, we remain bullish for the future of commuter aviation. The underlying factors that have propelled a restructuring of air transportation under deregulation—economics and competition—remain unchanged. In fact, the strike might actually accelerate commuter replacement service in the short haul, low- and medium-density markets that have become increasingly uneconomic for jet service, once ATC capacity constraints are eased.

The simple fact today is that the existing generation of 100 seat and larger jet transports, designed when the enplane price of jet fuel was less than 10 cents per gallon, has become obsolete in hundreds of markets as the price of fuel has increased tenfold to as high as $1.07 a gallon. This, coupled with the desire of long haul carriers to maintain passenger feed from outlying towns and communities, has created new market opportunities for commuter carriers hardly imagined just a few years ago.

The backbone of the commuter airline industry has been, and will continue to be, short-haul service to small communities, utilizing light aircraft typically seating 9 to 19 passengers. With deregulation, however, many of the new market opportunities being afforded commuters now require aircraft of larger passenger seating configurations able to operate overstage lengths of as much as 300 miles. These requirements have in turn, brought about a growing demand for a new generation of light transport aircraft seating 30 to 50 passengers, that provide comparable inflight amenities and service to the jet aircraft they are replacing.

The commuter airline industry shares the interest of the subcommittees that American manufacturers will be able to compete vigorously in the new light transport aircraft market that is now estimated to total a potential $16.6 billion in wordwide sales over the next 20 years. The U.S. commuter airline industry has been built over the past 20 years with aircraft principally manufactured by Beech, Cessna, Piper and Swearingen. We believe these and other U.S. airframe manufacturers have a substantial future in meeting the expanding needs of commuters.

Of growing concern to many is the apparent eclipse of U.S. airframe manufacturers to keep pace with the international competition, particularly in the development of the new generation, 30- to 50-seat transport aircraft.

While it is true that only two of the current seven major airframe programs in the 30- to 50-seat class involve U.S. manufacturers—I refer specifically to the model SF-340 joint venture project between Fairchild and Saab of Sweden, and the model CAC-100 proposed by the Commuter Aircraft Corp. of Youngstown, Ohio—we believe such statistics greatly distort the continuing U.S. aviation leadership role.

The plain fact is that of the remaining five projects, all make extensive use of products produced by American manufacturers, for example: engines, avionics, flight control systems, cabin environmental systems, auxiliary power units, even the aeronautical grade aluminum from which some of the airframes are assembled. Although these transports are manufactured overseas, 30 to 45 percent of the content value of these aircraft is of U.S. origin.

The CAAA believes that there should be clear distinction between Federal policy toward the continued development of a health domestic aviation industry and the maintenance of an economic network of U.S. air service under deregulation. We have been greatly concerned with recent ad hoc attempts to inhibit the U.S. sales of commuter transports manfactured in countries imposing various barriers to the sales of U.S. manufactured products. Clearly, this is a trade issue which the administration should attempt to redress on the basis of our bilateral relations with such countries. Erecting trade barriers to the U.S. marketplace only works to the detriment of the American air traveling public if commuter transport aircraft needed to maintain economic air service are restricted.

U.S. leadership in aviation manufacturing has long been a function of overall American product superiority as measured by such factors as performance, productivity, reliability, technical support, and operating economics. These are no longer attributes that can be applied to just American made products. A growing number of foreign manufacturers have demonstrated their capacity to challenge head on American dominance in aircraft design and manufacture.

To maintain the U.S. competitive advantage, we believe two market conditions must exist. First, U.S. manufacturers must be able to count on an economically viable market in which there is a reasonable expectation for recovery of development costs and for a reasonable return on investment.

Second, the manufacturer must be able to design and market an aircraft which gives serious challenge to the competition.

I would like to address these two issues further in closing out my statement. With respect to the establishment of a viable market, we believe that the long-term future for commuter airline service, both domestic and abroad, offers great new aircraft sales potential, as air transportation continues to restructure under deregulation and the changing economics of jet air service.

However, this future, which promises that virtually all short haul, small- and medium-size community passenger and cargo services will be provided by commuters, will occur only if we maintain an integrated national system of air transportation with interline connections, and if the elimination of needless subsidy that supports the continued operations of uneconomic jet equipment at those communities that otherwise could be better served by commuters without subsidy, is eliminated.

The maintenance of a uniform system of joint fares and the timely termination of section 406 subsidy are, thus, two important legislative proposals under consideration by the Congress today that will provide a healthy environment for commuter service. We urge their adoption, and we know your staff has been working on these two subjects. We urge timely adoption as soon as Congress reconvenes.

The second related program of great importance to commuter air carriers is the continued availability of FAA loan guarantees to support the financing of commuter aircraft. Such guarantees were extended for the first time to commuters with enactment of deregulation. Since then, a growing number of carriers have submitted applications for the purchase of much needed aircraft that they might not otherwise have qualified to buy.

Commuter airlines are just one of several classes of air carriers that are currently eligible for the loan guarantee program. The CAAA, therefore, has consistently urged that a commuter set-aside be maintained to assure the needs of short-haul passenger and cargo carriers are met. We were pleased that the administration has proposed in its fiscal year 1982 budget that the loan program be continued for commuters with an appropriation of $100 million. Maintenance of this commuter priority is vital, otherwise a few jet aircraft purchases could quickly deplete the program.

Extension of the FAA loan guarantee program beyond its 1983 sunset is particularly important, given the new generation transports coming on in 1984 and 1985. We would like to see the loan program extended as part of the essential air service program of the Airline Deregulation Act through 1988, and be applied to commuter airline needs.

With respect to the technical aspect of the U.S. marketplace, we believe that the commuter aircraft and engine technology research program recently completed by the National Aeronautics and Space Administration will contribute greatly to the development of future American light transport aircraft. Some of the design concepts reviewed by NASA offer promise for improvements in performance, for reductions in operating costs and for greater comfort and safety to passengers in the aircraft under development now and in the future.

The CAAA supports these efforts and urges the Congress to provide NASA with sufficient resources to take the next step in its light transport technology program, the validation of the reliability and feasibility of the new technologies it has identified.

Dr. Roskam previously made a very important point here. We now know what some of the technologies are that offer promise for us in the future. But applying those technologies and being able to submit them to FAA for certification in the design of new aircraft is another story. That certification process is very expensive. Thus, NASA has a major role in validating these new ideas with the kind of information that a manufacturer not only can look at and utilize, but then the FAA can apply as a benchmark for certification. That is a very important role for NASA that unless it undertakes, I am afraid the U.S. industry will not be able to afford to do because of the great costs involved. We believe this research by NASA will be an important factor in assisting U.S. manufacturers in meeting our future aircraft needs.

Finally, we believe there needs to be a clear distinction between development of a competitive domestic airframe industry and maintenance of a convenient network of air transportation under deregulation. Clearly, the former is a trade issue which the administration should attempt to redress on the basis of our bilateral relations with other countries. Erecting trade barriers to the U.S. marketplace only works to the detriment of the American air-traveling public if commuter transport aircraft needed to maintain economic services are restricted.

That concludes a review of views of CAAA. I am pleased to answer any questions you may have.

[The prepared statement of Mr. Stephen follows:]

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TESTIMONY

ALAN R. STEPHEN
VICE PRESIDENT, OPERATIONS
COMMUTER AIRLINE ASSOCIATION OF AMERICA

"THE FUTURE OF GENERAL AND COMMUTER AVIATION"

Subcommittee on Aviation
Senate Commerce, Science and Transportation Committee

Subcommittee on Transportation,
Aviation and Materials
House Science and Technology Committee

August 27, 1981
Wichita, Kansas

I am Alan R. Stephen, vice president of operations for the Commuter Airline Association of America (CAAA). The CAAA represents our nation's short-haul passenger and cargo airlines which principally operate aircraft seating 60 passengers or less or have a cargo payload capacity of 18,000 pounds or less in scheduled service. On behalf of our members, I am pleased to participate in these important hearings regarding the future of the commuter industry and our domestic capability to maintain leadership in the manufacturing of aviation products.

Before providing our views on the trade and technology issues of specific interest to the Subcommittees, I want to report what effect the events of the past four weeks has had on the commuter airline industry. The illegal and irresponsible walkout by some 12,000 air traffic controllers has rendered irrelevant virtually all forecasts of aviation activity, particularly those for the commuters. While it is too soon to assess what long term impact might accrue to commuters as a result of either constrained ATC capacity or residual passenger concern for safe and reliable air transportation, it is certain that the effects will be pervasive.

First, commuter traffic, the average number of passengers carried daily, is down twenty percent from comparable traffic levels of a year ago. We believe this will be a chronic problem for the airline industry as potential air passengers not only have concern for safety, but find former interline connections inconvenient or non-existent.

For commuters, this is a particularly acute problem. Under the flow control procedures imposed by the FAA to balance user demand with available system capacity, all air carriers, commuters as well as trunks, have been required to cut service by approximately 50 percent during peak travel hours at the 22 largest and most important air traffic hubs. Service frequency has long been the strategic basis for commuter scheduling. Without frequency and the concommitant well-timed connections it affords commuter passengers, many air travelers will find it more convenient to use alternative ground transportation modes, particularly the automobile, over the short distances commuters serve. Recapturing these passengers will pose a serious marketing challenge to commuters.

Second, the absolute capacity restrictions imposed by FAA to control traffic does not provide for replacement air services. One of the major successes of airline deregulation has been the fact that commuter airlines have maintained air transportation to communities that otherwise would have lost all or most such service as a result of the scale-back of markets that are no longer economic for the trunk and local service airlines. Since enactment of airline deregulation three years ago, some 200 communities formerly receiving certificated air service now are exclusively served by commuters. In addition, commuters have maintained the only scheduled air service at another 500 points. The capacity restrictions imposed by the FAA flow control plan will prohibit carriers from adding flights into the 22 busiest air traffic hubs probably for the next six to nine months, except in those few instances where a limited amount of extra ATC capacity exists that can be allocated to new entrants. The result is that new replacement air service will be precluded unless the replacing carrier trades off some of its existing service in order to provide new service to a market.

This flow control restriction has already created some problems for the small and non-hub air service still being performed by the trunk and local service air carriers. Many of these communities have sustained major cuts, even the temporary loss of air service, as the incumbent trunk or local service carrier has curtailed operations to comply with the FAA capacity control plan. Where commuters remain the only class of service in these communities, passenger loads have increased dramatically. Although commuters cannot increase flight frequencies to accommodate this demand, this is the one bright spot in an otherwise depressed short term market outlook for commuters.

Third, interline connections remain confused as all elements of scheduled transportation continue to adjust schedules and service patterns to adhere to FAA's flow control restrictions, passenger air travel needs and competition. With publication last week of revised flow control procedures for the next six months by FAA, we believe published airline schedules will finally reflect actual flight operations and interline connections beginning with the October 1st issue of the Official Airline Guide. This schedule stability, we believe, is a fundamental step to the restoration of broad public confidence in the ability to travel by air particularly where passengers must interline with other airline flights.

Fourth, the strike has badly weakened the financial condition of the commuter airline industry. This may ultimately mean that some carriers will have to suspend operations and that some communities could permanently lose all air service. Most commuter airlines are reporting that they are still operating 10 to 15 points below their "break even" load factors, although traffic has improved somewhat as the public has regained confidence in air travel. These losses, however, are occuring during the peak traffic season for commuters, depleting cash reserves normally used to cushion the lean winter months.

A principal concern of most commuter airlines is how they will continue to be able to service debt associated with recent aircraft acquisition. Since deregulation, the U.S. commuter airline industry has purchased and put into service some $600 million in new aircraft, leaving many carriers with high debt/equity ratios. Unlike some of the trunk or local service airlines that are able to ground less efficient aircraft that are already written off, commuters must keep all their aircraft flying in order to generate sufficient revenues to meet debt payments. Thus, the combined effects of substantially reduced passenger traffic and ATC capacity restrictions that limit aircraft utilization are serious concerns for the industry.

Finally, despite the economic hardship that commuter airlines have suffered as a result of the strike, the entire industry is united in its support for the Administration's handling of the issue. Earlier this week, representatives from some 100 commuter airlines serving the 22 capacity restricted airports met in Washington to review the FAA operating plan. Without exception, these executives reported that the FAA has maintained an operationally safe and reliable air traffic control system. Our greatest concern, thus remains,the lack of passenger confidence in air travel, not the confidence of our industry that it can maintain a regular schedule of on-time air service.

Despite the set back to the aviation system this strike has brought, we remain bullish for the future of commuter aviation. The underlying factors that have propelled a restructuring of air transportation under deregulation . . . economics and competition . . . remain unchanged. In fact, the strike might actually accelerate commuter replacement service in short-haul, low and medium density markets that have become increasingly uneconomic for jet service, once ATC capacity restraints are eased.

The simple fact today is that the existing generation of 100-seat jet transports, designed when the enplane price of jet fuel was less than $.10 per gallon, have become obsolete in hundreds of markets as the price of fuel has increased ten fold to as high as $1.07 per gallon. This, coupled with the desire of long haul carriers to maintain passenger feed from outlying towns and communities, has created new market opportunities for commuter carriers hardly imagined just a few years ago.

The backbone of the commuter airline industry has been, and will continue to be, short haul service to small communities, utilizing light aircraft typically seating 9 to 19 passengers. With deregulation, however, many of the new market opportunities being afforded require aircraft of larger passenger seating configurations able to operate over stage lengths of as much as 300 miles. These requirements have in turn, brought about a growing demand for a new generation of light transport aircraft seating 30 to 50 passengers, that provide comparable inflight amenities and service to the jet aircraft they are replacing.

The commuter airline industry shares the interest of the Subcommittees that American manufacturers will be able to compete vigorously in the new light transport aircraft market that is now estimated to total a potential

$16.6 billion in worldwide sales over the next 20 years. The U.S. commuter airline industry has been built over the past twenty years with aircraft principally manufactured by Beech, Cessna, Piper and Swearingen. We believe these and other U.S. airframe manufacturers have a substantial future in meeting the expanding aircraft needs of commuters.

Of growing concern to many is the apparent eclipse of U.S. airframe manufacturers to keep pace with the international competition, particularly in the development of the new generation, 30 to 50 seat and larger transport aircraft the marketplace now requires.

While is is true that only two of the current seven major airframe programs in the 30 to 50 seat class involve U.S. manufacturers, the model SF-340 joint venture project between Fairchild and Saab of Sweden, and the model CAC-100 proposed by the Commuter Aircraft Corporation of Youngstown, Ohio, we believe such statistics greatly distort the continuing U.S. aviation leadership role. The plain fact is that of the remaining five projects, all make extensive use of products produced by American manufacturers, for example, engines, avionics, flight control systems, cabin environmental systems, auxilary power units . . . even the aeronautical grade aluminum from which some of the airframes are assembled. Although these transports are manufactured overseas, the fact is that 30-45 percent of the content value of these aircraft is of U.S. origin.

The CAAA believes that there should be clear distinction between federal policy towards the continued development of a healthy domestic aviation industry and the maintenance of an economic network of U.S. air service under deregulation. We have been greatly concerned with recent ad hoc attempts to inhibit the U.S. sales of commuter transports manufactured in countries imposing various barriers to the sales of U.S. manufactured products. Clearly, this is a trade issue which the Administration should attempt to redress on the basis of our bilateral relations with such countries. Erecting trade barriers to the U.S. marketplace only works to the detriment of the American air traveling public if commuter transport aircraft needed to maintain economic air service are restricted.

The U.S. leadership in aviation manufacturing has long been a function of overall American product superiority as measured by such factors as performance, productivity, reliability, technical support and operating economics. These are no longer attributes that can be applied to just American-made products. A growing number of foreign manufacturers have demonstrated their capacity to challenge head-on American dominance in aircraft design and manufacture.

To maintain the U.S. competitive advantage, we believe two market conditions must exist. First, U.S. manufacturers must be able to count on an economically viable market in which there is expectation for recovery of development costs and for a reasonable return on investment. Second, the manufacturer must be able to design and market an aircraft which gives serious challenge to the competition.

We believe the long term future for commuter airline service, both domestic and abroad, offers great new aircraft sales potential, as air transportation continues to restructure under deregulation and the changing economics of jet air service. However, this future, which promises that virtually all short haul, small and medium size community passenger and cargo services will be provided by commuters, is also linked to the maintenance of an integrated, national system of air transportation with interline connections, and the elimination of needless subsidy that support the continued operations of uneconomic jet equipment at those communities that otherwise could be better served by commuters without subsidy. The maintenance of a uniform system of joint fares and the timely termination of Section 406 subsidy are two important legislative proposals under consideration by the Congress today that will provide a healthy environment for commuter service. We urge their adoption.

A related program of great value to commuter air carriers is the continued availability of FAA loan guarantees to support the financing of commuter aircraft. Such guarantees were extended for the first time to commuters with enactment of deregulation. Since then, a growing number of carriers have submitted applications for the purchase of badly needed aircraft that they might not otherwise have qualified to buy.

Commuter airlines are just one of several classes of air carriers that are currently eligible for the loan guarantee program. The CAAA, therefore, has consistently urged that a "commuter set aside" be maintained to assure the needs of short haul passenger and cargo carriers are met. We were pleased that the Administration has proposed in its FY 1982 budget that the loan program be continued for commuters with an appropriation of $100 million. Maintenance of this commuter priority is vital, otherwise a few jet aircraft purchases could quickly deplete the entire program.

Extension of the FAA loan guarantee program beyond its 1983 sunset is particularly important as airframe manufacturers begin introducing the new generation transports. Without it, few commuters could qualify for financing under reasonable rates and terms. We urge the Aviation Subcommittee to extend the loan guarantee program through 1988 to support the Essential Air Service Program, as part of the general review of CAB sunset issues.

We believe the commuter aircraft and engine technology research recently completed by the National Aeronautics and Space Administration (NASA) will contribute greatly to the development of future American light transport aircraft. Some of the design concepts reviewed by NASA offer promise for improvements in performance, for reductions in operating costs and for greater comfort and safety to passengers in the aircraft under development now and in the future. The CAAA supports these efforts and urges that Congress provide NASA with resources to take the next step in its light transport technology program, the validation of the reliability and feasibility of the new technologies it has identified. We believe this research by NASA will be an important factor in assisting the U.S. aviation industry in meeting the growing product challenge posed by international manufacturers.

Finally, for the first time, competition has become a factor in the development of light transport aircraft. It is a healthy trend that will result, we believe, in the excelerated development of a wide range of aircraft models ranging from 9 to 50 seats, that will allow U.S. commuter airlines to provide even better air service in a growing number of markets with a level of reliability and passenger comfort previously unmatched.

Thank you for your interest in the views of the Commuter Airline Association of America. I would be pleased to answer any questions you may have.

Mr. **Glickman**. Thank you.

Just one quick question, Mr. Stephen. Do you think the prop fan project should be expedited? Do you see that as a project that will help your industry if validated?

Mr. **Stephen**. I am not sure that any one product, for example, the design of a 50-seat prop fan, is what we are looking for. I think that question is better posed to the manufacturers. It seems to me that it is the practical application of technologies, a complete airframe design, is what is important to the manufacturers. It is less important that NASA has been able to design a complete product because there is no such thing as a perfect product for all markets.

The manufacturer, with his ability to look at what market segments exist, is far better able to develop a product that will meet market considerations, for example, seating capacity, operating altitudes, range, and other factors. Thus, the design of a product, prop fan in itself, is not what we are looking for. We are looking for the validation of the concepts that are now considered new and bold.

Mr. **Glickman**. The concepts of a much quieter, faster propeller propulsion system that uses less petroleum than you currently use, obviously would be intriguing.

Mr. **Stephen**. Absolutely. This research goes beyond just the actual conceptual use of technology. The NASA program has identified many uses inside the product, for example, improvements in the turboprop engine that are going to reduce operating costs and maintenance costs as well as reduce noise. All are very important factors.

Mr. **Glickman**. Without compromising any future plans that are in the quietude of the corporate board room of Air Midwest, how do you see our future in terms of route expansions and in terms of types of aircraft? You have talked about buying this new airplane, the Saab-Fairchild 340. You are the main commuter carrier in this part of the country. Where do you see things going?

Mr. **Adamson**. Of course, we don't have any current plans to eliminate very much of the service that we are providing now. So long as the Government wants to maintain that service, we will continue to do so. The main future lies in the short haul, high density area—Wichita-Tulsa, Kansas City-Tulsa—those areas he spoke about being no longer feasible to operate with large jet airplanes. The 34-passenger Saab will be able to provide that transportation very economically, will be very comfortable, and appeal to the passenger. That is where we see the biggest part of our future.

Mr. **Glickman**. Nancy?

Senator **Kassebaum**. I would just say I hope you continue to fly to western Kansas.

I would like to comment on an ending remark you had, Mr. Stephen, regarding trade barriers. There has been much conversation about it this morning. I am suggesting that a retaliation against those trade barriers is not particularly productive. I wonder how you would address, however, unfair trade barriers? What should be our reaction? How can we work from an equitable base when our competitors develop those trade barriers?

Mr. Stephen. That is a very complex question. The reason I am smiling, Madam Chairman, is that this is a conversation I had with my good friend Ed Stimpson of GAMA for over the past year.

Let me start with the fact that with respect to the sale of airplanes, 40 percent of the world market for commuter-sized airplanes lies in the United States today. The argument has been made that U.S. manufacturers have a very difficult time competing against international airframe companies that are subsidized by their governments in various ways, and thus can offer to pass on various types of financing and other attractive buyer incentive programs.

I can't comment on the exact financing arrangements that are being offered. I am not privy to that kind of information. However, the ability to compete in the airline market is significantly different than in the general aviation market. In the sale of aircraft to airlines, you are not just selling an airplane, you are selling a fleet of airplanes, you are selling the product support that comes along with it—financing programs, long-range development plans. The buyer takes into account what is the manufacturer willing to do to accommodate the design to the specific market needs of the airline, the need to train employees, porovide spare part inventories, and develop simulators and training manuals.

We can point to what may be a predatory financing package or it may not be. What I am trying to say is, there are so many different things that go into selling airlines, airplanes, that I am not sure you can ever assure equity.

The CAAA certainly will work toward resolving predatory practices. However, it is a fair issue that ought to be discussed in an open manner rather than perhaps behind closed doors. This is why this hearing is so very important. Beyond that, I must stress that there has to be a fine line distinction. It is very difficult to distinguish between what is predatory and what is competition in the American marketplace.

Ultimately—and I am very pleased we have a President like Ronald Reagan today—predatory financing will go away when we get our interest rates down to where they should be, when all financing is available at 6 or 7 percent, not 22 percent. Predatory financing can't occur when interest rates are at normal levels.

High interest rates have had a second effect. By making the U.S. dollar strong, U.S.-built airplanes are less favorable in terms of price to the U.S. customer relative to foreign-built aircraft. For example, one can buy a British-built airplane for 35 to 40 percent less than 6 months ago because of the growing strength of the U.S. dollar. It is fundamental that we get our economic house in order. So much of this trade problem will disappear when we do.

Senator Kassebaum. I know many of our problems will disappear if we can get interest rates down, or a good number of them would be much less pressing. But I think you point to the complexities, as I hoped to bring out when I asked the questions that I did this morning.

It is not easy to deal with this. I think your distinction of predatory practices is a good one. I think also, as I commented, it takes positive and extraordinary diplomatic skills to keep open negotiations, but constant ones, and a pressure there that is very important.

I would like to ask you, Mr. Adamson—we have talked about this a bit in the past and the importance of the commuter field and our own manufacturers moving into that field at perhaps a more rapid rate, in a more positive way than they have. And speaking to a number in the general aviation industry, they say that the commuter services have not significantly defined what they really need or want, and that they are uncertain whether that market is there without clear definitions given the great costs of expansion into it.

How do you answer that?

Mr. ADAMSON. I am glad you brought that up because there is really no answer. There are how many members of CAAA now?

Mr. STEPHEN. 170.

Mr. ADAMSON. 170. I imagine there are 170 ideal airplanes. The manufacturer is going to have to study the situation. He is going to have to take a shot at one area, and hope that he can encompass a large enough share of that market to make it pay. I am not sure that the 34-passenger airplane is exactly the size that we want, but weighing all the parameters and the other qualities that the airplane had, that is the one that we chose. We think there is a possibility they will stretch it to 50 passengers, or maybe a little less. If they do, then we are going to be interested in that, too.

I think there is just nobody going to be able to build the ideal airplane for the commuter airline industry because there is not one.

Senator KASSEBAUM. I think also it surely must be difficult—and as Dan was saying—in the corporate board room really to decide what the market is even going to be like 5 years from now as we sift through the changes and analyze the effects of deregulation, the effects of early sunset of the Civil Aeronautics Board, and so forth.

Perhaps it is just as well that everyone dosn't rush into a new type of production for a commuter line because we talked here about the need to leapfrog perhaps the present state of the art into some really innovative types of equipment and new machines that will better meet the needs 10 years from now. And so there will be some shifts and changes.

I think you have given us a good answer of really why general aviation as a whole might come back with the responses that they have. They don't know either. Will the market be there if they make an enormous commitment?

Mr. ADAMSON. Some foreign manufacturers have manufactured airplanes that are the ultimate compromise, I feel. I mean they are airplanes and they are selling them, and it is because there is nothing else to buy. You know, I would just like to see our people in it. They don't seem to want to be in it, though. So I guess we will just have to deal with what we have.

Senator KASSEBAUM. By the time they are in it, of course, they are reasoning, will we be too late? I suppose we all wish there were a crystal ball enabling us to make the correct decision.

Mr. STEPHEN. I would like, if I may, to bring up a related point. This is something that perhaps your subcommittees would be interested in. We have a need to certify a great number of transport airplanes in a very short period of time, both commuter-sized airplanes—the seven international projects we discussed—plus the new large transport Boeing 767, 757, and the European A-320. This is a tremendous amount of certification that is required both domestically and internationally through bilateral requirements.

The FAA has certainly made an effort to assure that it has sufficient technical expertise, concentrated where it is needed, for aircraft certification. In the past 6 months, I have spent quite a bit of time with the FAA in the Northwest region (Seattle) with the people responsible for airworthiness and certification of all these airplanes, not only the ones coming, but of all the transport airplanes that exist today. They have a tremendous responsibility, and they are understaffed.

I have discussed this with the FAA Administrator. Making sure the FAA has the proper resources and state-of-the-art understanding is extremely important if we are going to have these new airplanes certified on a timely basis. If they are not certified on a timely basis, we will deny the public economic air service for an extended period of time.

Mr. **GLICKMAN**. Thank you.

Our last witness is Dr. Stephen Piper, who is with the Office of the U.S. Trade Representative. I would like to welcome you here, Dr. Piper.

For the benefit of the audience, Dr. Piper is a unique gentleman because he held this role during the prior administration also, which I think speaks for his competence.

STATEMENT OF DR. STEPHEN PIPER, AEROSPACE TRADE POLICY COORDINATOR, OFFICE OF THE U.S. TRADE REPRESENTATIVE

Dr. **PIPER**. Mr. Chairman, thank you for your welcome.

Senator Kassebaum and Congressman Glickman, it is a pleasure to appear before you in America's heartland and the center of the world's general aviation industry to discuss the competitive posture of our commuter and general aviation aircraft industry in today's world market and to discuss questions for U.S. international trade policy that derive from that competitive posture.

Ambassador Brock appreciated your invitation to testify on trade policy matters. But as he is presently conducting trade policy discussions in Asia, he asked that I appear here in his stead.

I have submitted for the committee's consideration testimony for the record. With your permission, I should like to make just a few comments about it, and then discuss certain trade policy concerns.

One of the central issues in these hearings is the competitive posture of the U.S. general aviation and commuter aircraft industry vis-a-vis the foreign competition. My prepared statement provides background information on the numerous foreign programs in being for the development of commuter aircraft. In particular, the scattergram on page 4 illustrates the paucity of 30 to 50 seat aircraft projects prior to the Airline Deregulation Act of 1979, and the very considerable activity since then—activity by manufacturers all over the world, but focused principally on the U.S. commuter airline market.

The demand for commuter services and for commuter aircraft represents the greatest growth potential in the present air transport market. Most foreign manufacturers anticipate a worldwide market for something like 1,000 aircraft in this category through 1990.

You have already heard from GAMA, from the delegation from Ohio and others today as to what plans the U.S. industry has to meet this market demand. Foreign manufacturers, I can assure you, and you have had ample testimony to this effect already today, are moving rapidly to penetrate all segments of the U.S. commuter aircraft market. In 1979, Embraer of Brazil and deHavilland of Canada each announced new 30-seat aircraft powered by new design Pratt & Whitney of Canada turboprop engines.

The Embraer model, called the Brasilia, is due to have its first flight in 1984 with first deliveries in 1985. It will complement the 18 seat Bandeirante. I believe there are 51 Bandeirantes now in service in the United States.

The deHavilland aircraft, designated the Dash-8, is designed for markets for which its 50-seat Dash-7 is too large and its 19 seat Twin Otter is too small. Its first flight is planned for 1983 with deliveries to begin in 1984.

British Aerospace, Fokker of the Netherlands, and Israel Aircraft Industries are making major new efforts to sell their commuter aircraft in the U.S. market.

With a keen eye on the U.S. market, Short Bros. of Northern Ireland is lengthening the fuselage of its basic commuter model, the 30-seat 330, to produce by next year a 36-seat version. This program is 6 months ahead of schedule, and in fact, a test aircraft was flown at the Paris Air Show 2 months ago.

Also flown at the Paris Air Show were new 15-seat and 19-seat models from Dornier of West Germany.

Saab of Sweden has a 50-50 effort with Fairchild-Swearingen to develop a 34 seat aircraft.

Aerospatiale and Aeritalia have dropped independent competing programs and are joining forces to produce a 42 to 46 seat commuter, and Spain and Indonesia are jointly developing a 35-seat model.

Those are some of the foreign programs that are being developed, in almost each instance with substantial government support, and, as I say, focused principally on the U.S. market. For commuter aircraft probably 45 to 55 percent of the total world market is right here in the United States.

One of the major trade problems confronting our industry—and there has been a lot said about it today, and it confronts the Government as well—is the subsidization of export credit rates of interest. Such subsidization—and let's be clear about this—such subsidization—is an unfair trade practice and results in trade distortion for large transports, business jets, commuter aircraft, and general aviation models.

In U.S. export markets, the Export-Import Bank of the United States, subject to congressionally imposed limitations on its level of loan activity, can and usually does provide assistance to U.S. companies in offering competitive financing terms for major sales.

But in the U.S. domestic market, our aircraft manufacturers unfortunately, can find themselves at a competitive disadvantage.

Sales of foreign aircraft in the United States are often supported by official export credits provided by the exporting country.

For example, the Canadian Export Development Corp. commonly offers financing at an interest rate of 10 to 11 percent. The United Kingdom also offers attractive financing arrangements for purchases of Shorts aircraft. The purchase of 51 Brazilian Bandeirantes now operating in the United States was facilitated by export credit financing, which typically has the following characteristics: 15 percent down payment, 7½ to 10 percent interest rate, and a 7 to 9 year repayment term.

U.S. companies, particularly commuter airlines, do not have access to financing terms from U.S. sources that is comparable to these foreign government export credits. Even the FAA equipment loan guarantee program, which essentially removes the lender's risk, cannot yield competitive financing, nor was it ever intended to match subsidized export credit financing. The competitive disadvantage is particularly serious at a time of high interest rates, because of the very considerable spread between foreign government supported interest rates of 7½ and 10 percent and U.S. commercial rates.

We have no doubt about the ability of U.S. manufactured commuter and general aviation aircraft to compete with the best aircraft foreign manufacturers can develop. But the rules of competition at home and abroad must be such that the aircraft compete on their technological merits without the distortion of subsidies and without those trade restrictions that constrain market development.

The committee's invitation asked specifically what actions the Government should take to enhance the private sector's ability to compete effectively in the world aviation market. A direct answer to that question would have to include the following on the list of necessary actions:

First, we must take bilateral and multilateral steps to assure competitive access to world markets. Many foreign manufacturers receive government grants or loan guarantees for launching new aircraft projects. Ours, on the other hand, have to fund new programs from risk capital and retained earnings. To have a reasonable prospect of program profitability requires marketing on a world scale.

Second, the Agreement on Trade in Civil Aircraft, negotiated during the Tokyo Round of Mutilateral Trade Negotiations, establishes an internationally agreed framework for the conduct of trade in civil aircraft, engines and components. It needs effective enforcement. In some instances, enforcement actions will involve bilateral consultations; in others it will involve formal cases brought before the GATT.

The U.S. private sector, as well as the Government, must monitor compliance with the Agreement. Together—government and industry together—we must prepare well documented enforcement actions in those cases where we believe that our trade rights have been or are about to be denied or impaired.

We welcome the statement of Mr. Segner and the attitude of the FAA Administrator in assuring, or in monitoring international airworthiness certification standards and practices. And we, for our side on the trade aspects, look forward to working with Mr. Segner and his associates at the FAA on that problem, which is part of enforcing the Aircraft Agreement and also the Agreement on Technical Barriers to Trade, commonly known as the Standards Code, another aspect of the Tokyo Round of Multilateral Trade Negotiations.

Third, not all aircraft manufacturing countries are party to the Agreement on Trade in Civil Aircraft. We must encourage those who are not signatories to aline their aircraft trade policies with the international standard. It is going to take encouragement. At the same time, we must take into account the fact that the General Agreement on Tariffs and Trade [GATT] permits developing countries to impose certain restrictions on trade in order to foster their economic development.

Fourth, foreign aircraft programs offer a sizable market for U.S. manufacturers of engines, propellers, avionics, and other aircraft components. While we should seek maximum opportunity for our airframe manufacturers, we should not, we must not, lose sight of the competition our component manufacturers face, and the value of foreign sales to them and to the U.S. economy. We need to take steps to assure that they continue to have competitive access to their foreign market opportunities.

Export credits, subsidized by governments, are a distorting factor in aircraft competitions, selection competitions that should be based, as I said a moment ago, on the technological and economic merits of the aircraft. We should eliminate this distortion by seeking understandings with our trading partners as to interest rate minima, loan maturities, and other conditions of finance.

As a part of the overall administration effort to seek reform of official export credit practices, we are presently in the process of finalizing an understanding on financing conditions for current and future models of large transport aircraft. The executive branch is agreed that the next step regarding export credit financing in the aircraft sector should be a common line or understanding on commuter-size transport aircraft, and such a common line should, of necessity, involve all manufacturing countries.

Senator Kassebaum, Congressman Glickman, that concludes my statement. I should be pleased to answer any questions that you or members of the committee may have.

[The prepared statement of Dr. Piper follows:]

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PRESENTED BY WITNESS
AUGUST 27, 1981

THE COMMUTER AND GENERAL AVIATION AIRCRAFT INDUSTRY: INTERNATIONAL TRADE ASPECTS

Statement

of

Dr. W. Stephen Piper

Coordinator, Aerospace Trade Policy

OFFICE OF THE UNITED STATES TRADE REPRESENTATIVE

before the

Subcommittee on Aviation
Committee on Commerce, Science, and Transportation
U.S. Senate

and the

Subcommittee on Transportation,
Aviation, and Materials
Committee on Science and Technology
U.S. House of Representatives

THE COMMUTER AND GENERAL AVIATION AIRCRAFT INDUSTRY: INTERNATIONAL TRADE ASPECTS

Testimony of Dr. W. Stephen Piper, Office of the United States Trade Representative before the House Science and Technology Subcommittee on Transportation, Aviation, and Material and the Senate Commerce, Science, and Transportation Subcommittee on Aviation

August 27, 1981

Senator Kassebaum, Congressman Glickman, Members of the Committees, it is a pleasure to appear before you this morning in America's heartland and the center of the world's general aviation industry to discuss the competitive posture of our commuter and general aviation aircraft industry in today's world market and questions for U.S. international trade policy that derive from that competitive posture.

Ambassador Brock appreciated your invitation to testify on trade policy matters this morning. But as he is presently conducting trade policy discussions in Asia, he asked that I appear here in his stead. I was the chief U.S. negotiator for the development of the Agreement on Trade in Civil Aircraft during the recent Tokyo Round of Multilateral Trade Negotiations. My current assignment is to coordinate the development and conduct of U.S. aerospace trade policy.

With your permission, I propose to discuss, in order:

- commuter aircraft programs in production or development in foreign countries--which represent both the competition for our airframe manufacturers and a significant market opportunity for our component manufacturers.

- the importance of foreign markets to all segments of our own aircraft manufacturing industry.

- current trade policy issues confronting the U.S. industry and the Government.

FOREIGN COMMUTER AIRCRAFT PROGRAMS

As background for assessment of the competitive posture of our industry, we have, with the assistance of the Department of State and of our Embassies in many capitals around the world, assembled information on the numerous programs in being for the development of aircraft that are best described as passenger transports for commuter airline use. Following a general discussion of the foreign programs is a descriptive listing of individual programs.

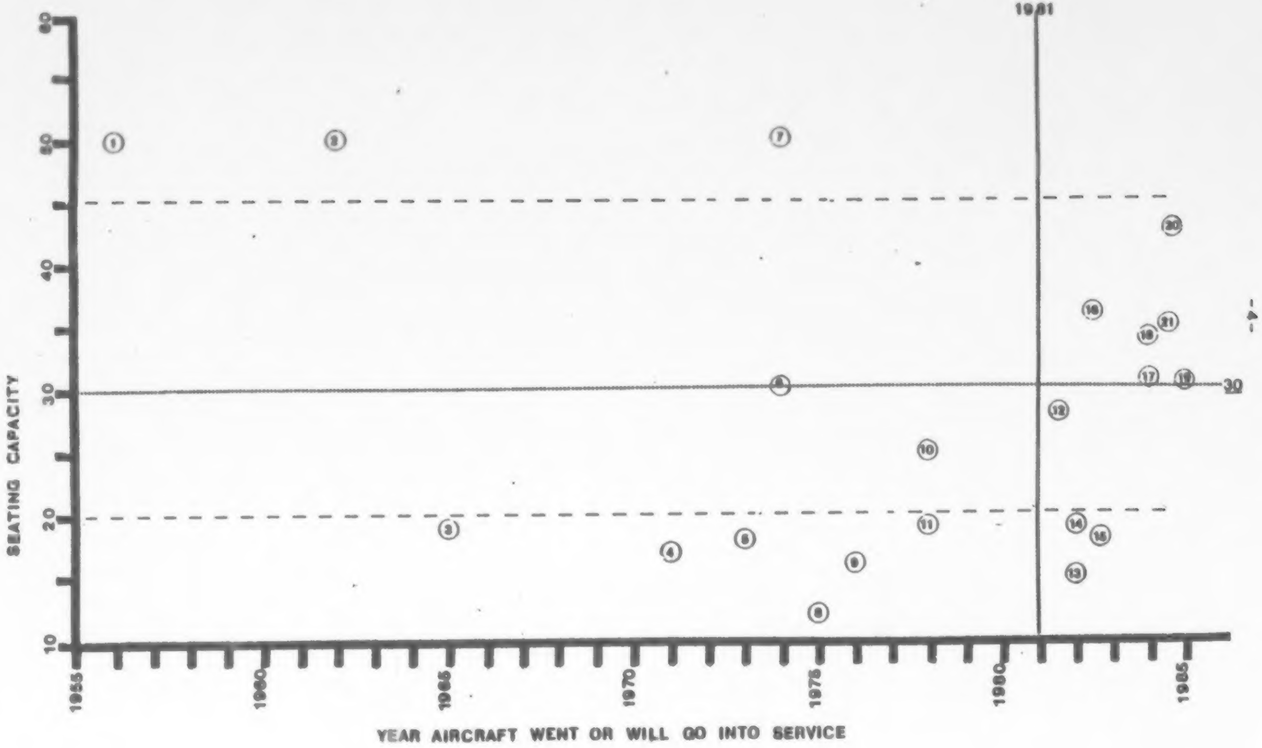
Foreign Commuter Aircraft

Commuter aircraft come in all shapes and sizes. Most, if not all, are turboprops. Some are pressurized, others are not. Most have two engines, others three or four. Some are box-like, others sleek. There are high-wing models and low-wing models, T-tails and conventional tails. Most are particularly rugged machines designed for short runways and frequent takeoffs and landings, and some for unpaved landing strips. And in the early 1970s there was an effort to produce an unusual two-engine overwing jet commuter. One model has a tail-mounted turboprop engine.

Foreign manufacturers produce a full range of these aircraft--from the 12-passenger Nomad 22B, produced by Australia's Government Aircraft Factories, to the 50-passenger Dutch F-27 and Canadian Dash 7. The scattergram on the next page illustrates the diversity of foreign commuter aircraft programs and indicates the focus of recent developmental efforts in the 30-50 seat range. Most of these aircraft programs have been influenced by sales opportunities in the U.S. market.

The foreign commuter aircraft seen most commonly in the United States are the 19-seat Twin Otter and 50-seat Dash 7, both from deHavilland of Canada, the 30-seat Shorts 330 from Short Brothers in Northern Ireland, and more recently the Bandeirante from Embraer in Brazil. These aircraft, all products of government-owned or established companies, have in common strong acceptance by U.S. commuter airlines, an acceptance facilitated in most cases by

FOREIGN COMMUTER AIRCRAFT IN PRODUCTION OR DEVELOPMENT



* AIRCRAFT LEGEND on NEXT PAGE

LEGEND FOR SCATTERGRAM

1. Dutch Fokker F-27
2. British Aerospace Corporation Model 748
3. deHavilland of Canada Twin Otter, DHC-6
4. Pilatus Britten-Norman Trislander
5. Brazilian Embraer Bandeirante 110
6. Short Brothers (Northern Ireland) Shorts 330
7. DeHavilland of Canada Dash 7, DHC-7
8. Australian Government Aircraft Factories Nomad 22B
9. Australian Government Aircraft Factories Nomad 24A
10. Spanish CASA 212-200
11. Israeli Arava 101B
12. Puerto Rican Ahrens AR-404
13. German Dornier 228-100
14. German Dornier 228-200
15. British Aerospace Jetstream 31
16. Short Brothers (Northern Ireland) Shorts 360
17. deHavilland of Canada Dash 8, DHC-8
18. Swedish/American Saab-Fairchild SF-340
19. Brazilian Embraer Brasilia 120
20. French/Italian ATR-42
21. Spanish/Indonesian CN-235

customer financing supported by the Canadian, British, and Brazilian Governments, respectively.

Aircraft are not only instruments of international commerce, but also products of international collaboration. Some aircraft are the products of international consortia--the Anglo-French Concorde and the Airbus are premier examples, but there are also the late Fokker-VFW effort to produce the VFW 614 and the present Fairchild-Saab joint project to develop a 34-seat commuter aircraft to be known as the SF 340. Most, however, have a clearly recognized nationality, but even most of these have substantial foreign content. For instance, the Dutch aircraft has British engines; the Brazilian aircraft has Canadian engines, French landing gear, and avionics and numerous other sytems from the United States. Engines from Avco Lycoming, Garrett, and General Motors (Allison Division) power the commuter aircraft from Switzerland, Spain, and Australia, respectively. U.S. avionics, flight control systems, and components are in common use in aircraft of all nationalities. The most popular engine for commuter type aircraft is the PT6A, produced by a Canadian subsidiary of a Connecticut company, with many components being produced in West Virginia. Various models of this engine power commuter aircraft built in the United States, Brazil, Canada, Israel, and Northern Ireland.

Characteristics of the U.S. Market

The United States, historically and presently, represents the largest aviation market in the world (here and later taken to exclude the Soviet Union and Eastern Europe). Partly as a function of our geographic expanse, partly as a function of the availability of capital and economic resources, partly as an outgrowth of our World War II industrial base, and partly as a function of our public policy of stimulating the growth of aeronautics, we have the largest aircraft fleet, the most airports, and the greatest utilization of air transport in the world. Of the approximately 300,000 general aviation aircraft in the world, about two-thirds are located in the United States. We generate 40-45 percent of the world's commercial aircraft passenger-miles, and have 45 percent of the world's turbine powered transports. While I do not have specific data for commuter aircraft, it is reasonable to suggest that the United States represents 45-55 percent of the world's market for such aircraft.

Moreover, the United States has been the world's major producer of aircraft--some 81 percent of jet transports now in service worldwide are of U.S. manufacture, and 90-95 percent of the world's general aviation aircraft were built here in Wichita and elsewhere in the United States. Last year the U.S. general aviation industry produced 11,881 aircraft, and we produced 415 commercial transports. But for reasons discussed next, we did not produce many commuter aircraft.

Market Developments in the United States

In the 1950s, the Douglas DC-6 and the British Viscount were typical of trunk airline aircraft; these had a capacity in the 50-54 seat range. With the introduction of the 4-engine jet transports in the late 1950s, the first line aircraft of trunk airlines had a capacity in the 100-140 seat range, and these soon grew to have 120-180 seats. Then a number of 2- and 3-engine jet transports were introduced with 75-110 seats, replacing considerably smaller propeller-driven aircraft, such as the Convair 240, 340, and 440 and Martin 404, which had capacities in the 40-56 seat range. Public acceptance of the jets, in terms of both speed and comfort in flight, hastened the retirement from the fleets of major airlines, of the slower and smaller propeller aircraft and eclipsed the market potential of a series of large (i.e., 60-100 seat) turboprop transports.

When the trunk airlines and the major aircraft manufacturers moved into the jet era and onto larger transports, there was little incentive to develop new aircraft, whether propeller or jet powered, for the second and third tier airlines. Part 298 of the Economic Regulations of the U.S. Civil Aeronautics Board limited non-certificated carriers (the air taxi and commuter operators) to aircraft with a seating capacity of not more than 30. The so-called local service carriers in the United States had a large supply of new and used aircraft such as Douglas DC-3s and DC-6s; Martin 202s and 404s; Convair 240s, 340s, and 440s (many of which were converted to a turboprop version designated the 580); and Fokker-Fairchild F-27s and FH-227s, to satisfy their requirements until they in time also transitioned to jets.

Thus, there was not in the 1970s a substantial market for a new-design commuter-type aircraft with 30-60 seats. Indeed there was little demand for new 20-seat aircraft. Here again, economics was a factor. The U.S. Federal Aviation Administration does not require a flight attendant in the passenger cabin of an aircraft with 19 or fewer seats. But with 20 seats an attendant is required, and then economics requires enough additional seats to pay for having the attendant on board. (An attendant requires not only a salary, but also a seat, and adds to the weight.)

At the same time, technological developments, traffic growth, and economic imperatives combined to lead to larger and larger jet transports. The concern of both airlines and aircraft manufacturers with investment cost per seat and operating cost per seat-mile has also led to increases in the seating capacity of each series of jet transports.

By 1978 only one civil passenger transport in the 15-95 seat range was in production in the United States, Swearingen's Metro

II, an 18-22 seat twin-engine turboprop. And none were planned. The investment cost alone in a new program was a major barrier that had to be overcome. The FAA was revising its airworthiness certification requirements for commuter-type aircraft; knowledge of these was considered to be a prerequisite for launching a new program, or even resurrecting an old one.

Foreign manufacturers, on the other hand, found themselves in a somewhat different situation. In most cases their production programs are supported by their governments. Government funds are available for launching projects, and for continuing programs with low, inefficient production rates. Public investment in competitive aircraft programs is deemed to be a reasonable means of earning foreign exchange, assisting in industrial development, or providing for particular transport requirements (such as in remote regions of Australia or Canada with unpaved landing strips, or where runways or approaches are short). Thus, the hurdles to launching a foreign program are in many cases lower, and the economic requirements as to production efficiency are less stringent.

The Impact of Deregulation

The Airline Deregulation Act of 1978, the decision to use FAR 25 regulations for commuter aircraft certification, and the demand for small community air services have had a revolutionary impact on the commuter aircraft industry. While these developments are all domestic, they have important consequences for the world's commuter aircraft manufacturers.

- First, the limitation of air taxis and commuters to aircraft of not more than 30 seats has been changed to aircraft of not more than 60 seats. And it is now easier to establish an airline, using any size aircraft. Consequently, for the first time in over a decade there are potential customers in the United States for commercial passenger aircraft in the 30-55 seat range.

- Second, trunk and local service carriers have greater freedom in eliminating services of their now relatively large jets at points where such services are not economically viable, and these low-frequency, high-capacity services can be replaced by the higher-frequency, lower-capacity services characteristic of a commuter-type operator. Commuter airlines have started to expand to serve these markets, and thus we find the more economical commuter services being offered in many more markets.

- Third, to facilitate the purchase of new commuter aircraft in order to enhance assurance that our smaller communities would continue to have necessary and desired air services, the deregulation act provided an equipment loan guarantee program whereby the Federal Aviation Administration can guarantee commercial loans used for the purpose of purchasing new aircraft to serve commuter markets.

The demand for commuter services and for commuter aircraft represents the greatest growth potential in the present air transport market. Most foreign manufacturers anticipate a worldwide market for 1,000 aircraft in the 20-40 seat range through 1990.

I defer to GAMA and others on your witness list to testify as to what plans the U.S. industry has to meet this market demand. Foreign manufacturers, I can assure you, are moving rapidly to penetrate all segments of the U.S. commuter aircraft market. In 1979, Embraer of Brazil and deHavilland of Canada each announced new 30-seat aircraft powered by two new-design PT7 Pratt and Whitney of Canada turboprop engines. The Embraer model, called the Brasilia, is due to have its first flight in 1984, with first deliveries in 1985; it will complement the two 18-seat Bandeirante models now in service. The new deHavilland aircraft, designated the Dash 8, is designed for markets for which its 50-seat Dash 7 is too large and its 19-seat Twin Otter is too small. Its first flight is planned for 1983, with deliveries to begin in 1984. British Aerospace, Fokker, and Israel Aircraft Industries are making major new efforts to sell their F-27 (50 seats), BAe 748 (50 seats), and Arava 101B (18-20 seats), respectively, in the U.S. market. Short Brothers is lengthening the fuselage of its Shorts 330 to produce by next year a 36-seat Shorts 360, with a keen eye on the U.S. market. This program is 6 months ahead of schedule, and in fact a test aircraft was flown at the Paris Air Show 2 months ago.

COMMUTER AIRCRAFT IN DEVELOPMENT OR PRODUCTION OUTSIDE THE CONTINENTAL UNITED STATES

In Australia

12-seat	Nomad 22B
16-seat	Nomad 24A

Both are nonpressurized turboprops manufactured by Government Aircraft Factories, a government corporation, and utilize General Motors Allison Division engines.

In Belgium

Sonaca (Societe Nationale de Construction Aerospatiale) was formed in 1978, with 50 percent of its initial capital coming from the Belgian Government. The company, which presently makes components for the A310 and is involved in F16 coproduction, is reported to be considering collaboration in a 30-50 seat commuter aircraft project.

In Brazil

18-21-seat	Bandeirante unpressurized, in production
18-21-seat	Bandeirante pressurized, in development
30-seat	Brasilia planned for 1985 introduction

Both aircraft are products of Embraer, of which the Brazilian Government owns 51 percent of the voting shares and for which 90 percent of the subsidized capital is held by private shareholders.

Through 1980, production of the Bandeirante totaled 326 aircraft in all versions--maritime surveillance, military transport, and commuter airliner. There are presently 51 of these aircraft in service with 24 U.S. commuter airlines with 9 additional units on order.

U.S., Canadian, and European firms contribute about 40 percent of the value (current list price is $1.5 million) of a Bandeirante: 20 percent U.S, 15 percent Canadian, and 5 percent European. The current production rate is 70 aircraft per year.

The Brasilia is planned for 1985 introduction into service. At present, U.S. orders total 15 with options for an additional 38.

In Canada

19-seat DHC-6 (Twin Otter)
50-seat DHC-7 (Dash 7)
32-36-seat DHC-8 (Dash 8) planned for 1984 deliveries
14-28-seat Canadair Challenger

DeHavilland of Canada (DHC) is a government-owned company, which has concentrated its passenger aircraft development efforts on STOL (short takeoff and landing) aircraft. The Twin Otter was first announced in 1964 and some 800 aircraft have been sold to civil and military operators in 80 countries. The Dash 7 was certificated in 1977, and more than 50 are now in service, almost all outside of Canada. Another 85 aircraft are on order or option.

The Canadian Government has assisted the development of the Dash 8, which is to be Canada's entrant in the 30-seat commuter competition for quiet, fuel-efficient, short-haul transport aircraft, by providing guarantees for $450 million (Canadian) in commercial bank loans for aircraft design, development, and production and a $50 million (Canadian) grant to Pratt & Whitney of Canada to assist development of a new, improved turboprop engine, the PW100 (formerly PT7A), for the Dash 8. This engine has also been selected for Embraer's Brasilia.

DeHavilland has received letters of intent to purchase more than 80 Dash 8's, to include letters from the following U.S. commuter airlines: Air Oregon, Air Pacific, Air Wisconsin, Henson Aviation, Golden Gate, Golden West, Pennsylvania Commuter, Ransome Airlines, Rocky Mountain, Rio, and Southern Jersey Airlines. U.S. customers account for about two-thirds of current orders.

The Challenger by Canadair, coming into service this year, is being marketed in a number of versions from a 14-seat executive transport to a 28-seat commuter or corporate transport. Of all the existing and new aircraft advertised for the commuter market, it is the only turbofan model, being powered by two Avco Lycoming ALF 502L fan engines, with a GE-powered version also being developed. Orders to date are for 130 with the basic Avco engines, and 57 with GE engines.

In France and Italy

42-46-seat	ATR 42

Earlier this year Aeritalia of Italy and Aerospatiale of France announced they were putting aside individual programs in the 30-50 seat range, to work jointly on a 42-46 seat commuter transport, to be powered by two Pratt & Whitney of Canada PW100 engines. The program calls for initial deliveries in 1985. Both Aeritalia and Aerospatiale are government-owned companies.

In Germany

15-seat	Dornier 228-100
19-seat	Dornier 228-200

Dornier is a privately owned manufacturer of civil and military aircraft. These two models are generally similar except for length of fuselage, accounting for the difference in seating capacity. Both models, powered by two Garrett AiResearch TPE 331-5 turboprop engines, were introduced at the 1981 Paris Air Show. Airworthiness certification for the -100 is anticipated in October 1981 and for the -200 in December 1981.

Dornier has reported that development of these two models cost about $20 million with the Federal Republic of Germany economics ministry providing a loan in support of this cost.

In Indonesia and Spain

35-seat CN 235

CASA of Spain and P.T. Nurtanio of Indonesia, both largely government-owned, have announced joint development and production of a new design high-wing, pressurized 35-seat commuter aircraft for entry into service in 1985. General Electric's new turboprop engine, the CT 7-7, has recently been selected to power this twin turboprop, after a competition with the PW100. (The same basic engine has also been selected by Fairchild and Saab for the SF 340.) The joint production CN 235 project is an outgrowth of P.T. Nurtanio's licensed production of CASA 212-200 utility/commuter aircraft.

Production is envisioned at the rate of four per month in both Seville, Spain, and Bandung, Indonesia. The first flights of the two prototypes are scheduled for October 1983.

In Israel

18-20-seat ARAVA Model 101B and Model 102

These aircraft are products of Israel Aircraft Industries, a government-owned company. The first flight of the ARAVA was in November 1969. Model 101 was certificated by the FAA in April 1972; Model 102 by the Israel Civil Aviation Administration in April 1976. Both models have Pratt & Whitney of Canada PT6A turboprop engines. The military transport versions have outsold the civil models, with most military customers being in South America. As of last year sales reached more than 80, with 50 being for South American military forces, and 6 civil versions being sold in Argentina and 2 in Africa.

Model 101B is a new model under discussion for development designed to compete in the U.S. commuter market.

In the Netherlands

50-seat Fokker F-27

Deliveries of this pressurized turboprop (Rolls-Royce Dart engines) began in 1958. Sales of the various models (military and civil) to date exceed 700 (of which 205 were built under license in the United States by Fairchild Industries). The distribution of sales has been 27 percent in North and South America, 22 percent in Europe, 22 percent in Asia, and 29 percent elsewhere. The current production rate is about 30 per year.

In Puerto Rico

27-30-seat Ahrens AR-404

Production of this nonpressurized turboprop (four Allison 250B-17B engines) utility transport began last year. Of the current orders, most are for operators in the Caribbean, but with a few for Alaska, Canada, and the Continental United States.

In Spain

25-seat CASA 212-200

The CASA 212-200 is a nonpressurized twin-turboprop (Garrett-AiResearch TPE 331-10-501C engines) STOL utility transport with about 30 percent U.S. content (principally engines and avionics). Introduced in 1979, it is an improved version of the original CASA 212-5 Aviocar introduced in 1971 to fill six main roles: 16-seat paratroop transport, military freighter, ambulance, photographic transport, crew trainer, and 19-seat civil transport.

Sales of the CASA 212-5 and 212-200 now total 260, and production continues at the rate of four a month in Spain and two a month in Indonesia, where P.T. Nurtanio is producing this aircraft under license. Five U.S. commuter airlines are included in the 212 customer base.

Indonesian deliveries to date exceed 30.

CASA is 65.6 percent owned by the Spanish Government, 20 percent by Northrop Corporation, and 13.4 percent by Spanish banks, Messerschmitt-Bölkow-Blohm and Dassault. U.S. license manufacture of the 212 is reportedly under consideration.

In Sweden

34-seat SF 340

Saab-Scania of Sweden and Fairchild Industries (Swearingen Division) have concluded an agreement for joint development, production, and marketing of a 34-seat twin truboprop commuter aircraft, to be known as the SF-340.

Production is to be shared equally, with final assembly being in Sweden. The new General Electric CT7-5A turboprop is the chosen power plant. Saab-Fairchild has chosen a Collins all-digital flight guidance, autopilot and avionics system, the same system utilized by Boeing in its 757 and 767 aircraft, for the 340, providing unprecedented capability for a short-haul turboprop airliner and low maintenance cost.

Contracts and firm paid options totaled 101 on June 1, 1981, including 15 for 5 U.S. commuter airlines, 25 for U.S. corporate customers, 31 for European commuter airlines, 18 for customers in Australasia, and 11 elsewhere. The roll-out is scheduled for November 1982, with the first flight to follow shortly thereafter. Deliveries are scheduled to being in 1984.

Saab-Scania reports that it has arranged a Swedish Government loan on commercial terms to finance part of its share of the development cost.

In the United Kingdom

48-50-seat	BAe HS 748
18-19-seat	British Jetstream 31
17-seat	Pilatus Britten-Norman Trislander
30-seat	Shorts 330
36-seat	Shorts 360 to be available in 1982

Of these five aircraft (all turboprops except for the Trislander), the BAe HS 748 and Jetstream 31 are products of British Aerospace, a corporation now half-owned by the Government of the United

Kingdom, as last year one-half ownership was sold to private investors. The Jetstream 31, announced in December 1978, is a new version of the earlier Handley Page Jetstream. It has commuter, executive, and military versions, all pressurized and powered by two Garrett AiResearch TPE 333-10 turboprop engines. British Aerospace reportedly projects the North American demand in the decade ahead for 15-20 seat commuter aircraft at 900, and seeks a 20 percent share for the Jetstream 31.

A new series (Series 2B) of the Rolls-Royce Dart-powered BAe HS 748, originally designed in 1959, became standard in 1979 and offers improved flight characteristics. Only with the Airline Deregulation Act of 1978 has BAe made efforts to market the 748 in the United States. Some 75 percent of the sales to date (over 140) have been in developing countries.

In 1979 Pilatus of Switzerland took over the assets of Britten-Norman, and in particular its Isle of Wight production facilities, for the nonpressurized 9-seat Islander and 17-seat Trislander commuter transport aircraft. The Trislander, powered by three Avco Lycoming six-cylinder 0-540-E4C5 piston engines, is a stretched version of the twin-engined Islander with a third engine installed on the vertical stabilizer.

The United Kingdom's leading commuter aircraft manufacturer is Short Brothers, based in Belfast, Northern Ireland, a government-owned company. The Shorts 360 is a stretched version of the Shorts 330 with an improved Pratt & Whitney of Canada PT6A powerplant. The Shorts 360, developed in response to the expansion of the U.S. commuter market, was demonstrated at the 1981 Paris Air Show, and will be available for delivery in 1982. By stretching an existing model and utilizing an existing powerplant, the Shorts 360 will be the first entrant in the new 30-50 seat market, some 2 years ahead of the SF-340, Brasilia, CN235, and Dash 8, all of which involve a new more fuel-efficient turboprop engine, either the PW100 or CT-7. U.S. airlines have been the initial customers for both the 330 (Command Airways in 1974) and the 360 (Surburban Airlines). As of a year ago, Short Brothers had received 60 firms orders for the 330, (39 for U.S. airlines, 3 for Canada, 7 for the Caribbean and South America, 2 Scotland, 9 for Germany and Greece), of which about 30 had been delivered.

OVERVIEW OF THE U.S. AEROSPACE INDUSTRY

The following facts regarding the composition of the U.S. aerospace industry, its role in the American economy, and the importance of foreign trade in its long-term viability are pertinent:

- Civil aircraft sales represent an important an increasing proportion of the industry's sales.
- In terms of the dollar value of sales, civil aircraft, engines, and parts totaled $17.2 billion in 1980; the value of comparable military items was $14.8 billion.
- Aerospace exports in 1980 were valued at $14.57 billion, an increase of 24 percent from 1979, and accounted for slightly more than 10 percent of all U.S. exports of manufactures.
- Civil aerospace exports, accounting for 73 percent of sales were valued at $12.58 billion, an increase of 29 percent, from 1979. Summary data on the value of exports are:

EXPORTS BY PRODUCT SECTOR

	Value of Exports in Millions of Dollars	Percent Increase From 1979	As Percent of all Civil Aerospace Exports	Exports As Percent of Sales
Commercial transport aircraft	$ 6,173	24%	49%	60%
General aviation aircraft	739	14%	6%	32%
Helicopters	285	38%	2%	45%
Other aircraft, including used aircraft	543	69%	4%	N/A
Turbine engines	468	45%	4%	N/A
Other engines	45	-13%	1%	N/A
Parts, accessories, and equipment	4,325	34%	34%	N/A
TOTAL:	$12,578	29%	100%	73%

See the tables in Annex A for additional data.

- Civil exports accounted for 85 percent of the industry's exports in 1980.
- In the recent _Fortune_ ranking of America's 50 leading exporters, 5 of the top 10 were either totally or predominantly involved in aerospace production. (See Annex B).
- Currently 1.2 million persons are employed in the production of airframes, engines, aircraft components, and other aerospace products. Within this group a large percentage of employees are involved in high technology work, thus enabling U.S. aerospace manufacturers to remain on the cutting edge of a competitive industry.
- The private R&D activities of the aerospace industry have resulted in major technological innovations which have benefitted not only the commercial sector, but have also had military spinoffs.
- The industry is composed of many small companies, as well as the well-known large ones. For example, some 4,200 companies (of which 3,500, located in 44 States are classified as small businesses) assist in the production of the 4½ million parts of a single $70 million 747.
- In 1980 general aviation exports totaled 3,559 aircraft, or 30 percent of the 11,881 aircraft shipped. In terms of dollar volume, exports were valued at $739 million, or 29 percent of the $2.5 billion in total sales.

INTERNATIONAL TRADE AND COMPUTER AIRCRAFT

From a trade policy perspective, the United States has several interests in the civil aircraft sector. First, as has already been noted, aircraft manufacture is a major U.S. industry and one in which export sales are vital, not only in adding to total employment and sales volume, but importantly in contributing to economies of scale. Export sales account for one-quarter to one-half the activity level for most of our programs, and unit costs are particularly sensitive to volume of production within the range of activity typical of most U.S. aircraft programs. Consequently, the addition of export sales has a substantial effect in lowering the price of aircraft to U.S. purchasers.

Second, U.S. aircraft are technologically competitive with, if not superior to, any in the world; our manufacturing practices are the most efficient. To maintain this position, and to be able to generate the substantial sums of capital required to launch new programs, our aircraft manufacturers must have access to the world markets on a competitive basis.

Third, at the same time that we state the need for U.S. airframe manufacturers to have access to world markets, we should note that U.S. component and equipment manufacturers have substantial sales prospects with the many aircraft construction programs being pursued in other countries. We need to take steps to assure that they continue to have competitive access to these market opportunities.

The fourth trade policy interest I would cite is the need to assure that U.S. manufacturers are not confronted with unfair competition from imports within our own domestic market.

Market Access

The Agreement on Trade in Civil Aircraft, resulting from the Tokyo Round of Multilateral Trade Negotiations (MTN), has substantially facilitated competition and access in the markets of the signatories for commuter aircraft, engines, components, and equipment by eliminating all customs duties previously imposed by the signatories on such items. No longer are the selling prices of U.S. aircraft or components increased to take account of customs duties in Canada, Japan, or 15 European countries. No longer do we impose a 5 percent duty on commuter aircraft from Brazil, Canada, the United Kingdom, or anywhere else outside the Soviet Bloc, duty that no longer has to be paid by U.S. commuter airlines.

But only the 18 signatories to the Aircraft Agreement have bound these duties at zero and have pledged not to impose import restrictions on aircraft or parts. Yet other countries such as Australia, Brazil, Indonesia, and Israel manufacture commuter aircraft, and they may impose tariffs or other import charges to the extent such charges are consistent with their GATT obligations.

The GATT does, however, provide special considerations for import restrictions in developing countries, recognizing that they have a need and a right to foster the development of local industries. But there are also limitations on arbitrary resort to such special considerations; we are working with a number of countries at the present time in an effort to encourage them to provide a maximum of competitive market access for U.S. aircraft and components.

I might note that the Tokyo Round MTN Agreements on Technical Barriers to Trade (Standards), on Import Licensing Procedures, on Government Procurement, and on Customs Valuation also serve to protect U.S. trade interests with respect to market access for commuter and general aviation aircraft. All of these agreements impose particular limitations on the resort to imposition of non-tariff barriers or discriminatory policies.

Fair Pricing

Pricing is a second area, after market access, where we have substantial trade concerns. The Agreement on Trade in Civil Aircraft (Article 6.2) is explicit in stating that the "pricing of civil aircraft should be based on a reasonable expectation of recoupment of all costs." All costs as used here would certainly include the costs or value of governmental assistance, if any, provided for the development, production, or marketing of particular commuter or general aviation aircraft. As in most instances, U.S. manufacturers are competing with government-owned or government-supported companies; the question of assuring that prices cover the costs of governmental support is particularly important--and difficult. Again, this explicit discipline regarding the impact of governmental subsidies or supports will apply only with respect to commuter aircraft from Canada, the Federal Republic of Germany, France, Italy, Sweden, the United Kingdom, and the other signatories to the Agreement on Trade in Civil Aircraft, but it is an international standard that can be used to measure the performance of others.

However, the Tokyo Round of Multilateral Trade Negotiations also produced an Agreement on Subsidies and Countervailing Measures. That agreement imposes disciplines on both domestic and export subsidies. We can and intend to monitor the practices of signatories to this agreement, which include Brazil, as well as those of signatories to the Aircraft Agreement, to assure that its provisions are being adhered to, and that U.S. trade interests regarding commuter and general aviation aircraft are not being impaired. The Subsidies Agreement is explicit in noting that a foreign government's production subsidies for aircraft manufacturing could impair U.S. trade interests by causing a loss of U.S. sales, whether in our domestic market, in that manufacturer's home market, or in third country markets.

Competitive Sales Terms

I have previously noted our concerns with assuring that the U.S. manufacturers of commuter and general aviation aircraft and components enjoy competitive market access worldwide and that they are not injured as a consequence of subsidies to their foreign competitors. Now I wish to turn to the question of officially supported export credits and their impact on market competitions.

Obtaining effective discipline on official export credit financing for aircraft remains a subject of major concern. In U.S. export markets the Export-Import Bank of the United States, subject to Congressionally imposed limitations on its level of loan activity, can and usually does provide assistance to U.S. companies in offering competitive financing terms for major sales.

But in the U.S. domestic market, our aircraft manufacturers can find themselves at a competitive disadvantage. Sales of foreign aircraft in the United States are often supported by official export credits provided by the exporting country. For example, the Canadian Export Development Corporation commonly offers financing at an interest rate of 10-11 percent. The United Kingdom also offers attractive financing arrangements for purchases of Shorts aircraft. The purchase of many of the Brazilian Bandeirantes now operating in the United States was facilitated by export credit financing, which typically has the following characteristics: 15 percent down payment, 7½-9 percent interest rate, and a 7-9 year repayment term.

U.S. companies, particularly commuter airlines, do not have access to comparable financing terms from U.S. sources. Even the FAA Equipment Loan Guarantee program, which essentially removes the lender's risk, cannot yield competitive financing, nor was it intended to match export credit financing, which typically entails below-market (and therefore subsidized) rates of interest. The competitive disadvantage is particularly serious at a time of high interest rates because of the considerable spread between foreign government supported interest rates of 7½-8½, or even 9-11 percent, and U.S. commercial rates, which even with an FAA guarantee will not be below those of a comparable Treasury bond.

TRADE POLICY DIRECTIONS

We have no doubt about the ability of U.S. manufactured commuter and general aviation aircraft to compete with the best aircraft foreign manufacturers can develop. But the rules of the competition--at home and abroad--must be such that the aircraft compete on their technological merits--without the distortion of subsidies and without those trade restrictions that constrain market development.

The Committees' invitation asked specifically what actions the Government should take to enhance the private sector's ability to compete effectively in the world aviation market. A direct answer to that question would have to include the following on the list of necessary actions:

o The Agreement on Trade in Civil Aircraft establishes an internationally agreed framework for the conduct of trade in civil aircraft, engines, and components. It needs effective enforcement. In some instances, enforcement actions will involve bilateral consultations; in others, it will involve formal cases brought before the GATT. The U.S. private sector, as well as the Government, must monitor compliance with the Agreement, and together we must prepare well-documented enforcement actions in those cases where we believe our trade rights have been denied or impaired.

o Not all aircraft manufacturing countries are party to the Agreement on Trade in Civil Aircraft. We must encourage those who are not signatories to align their aircraft trade policies with the international standard, at the same time taking account of the trade practices permitted developing countries under the General Agreement on Tariffs and Trade (GATT).

o Foreign aircraft manufacturers offer a sizeable market for U.S. manufacturers of engines, avionics, and other aircraft components. While we should seek maximum opportunity for airframe manufacturers, we should not lose sight of the competition our component manufacturers face, and the value of foreign sales to them and to the U.S. economy.

o Export credits, subsidized by governments, are a distorting factor in aircraft competitions--selection competitions that should be based on the technological and economic merits of the aircraft. We should eliminate this distortion by seeking understandings with our trading partners as to interest rate minima, loan maturities, and other conditions of finance. As a part of the overall Administration effort to seek reform of official export credit practices, we are in the process of finalizing an understanding on financing conditions for current large transport aircraft, that is within the context of the May 1975 Standstill Understanding on Aircraft Financing. The Executive Branch is agreed that the next step regarding export credit financing in the aircraft sector should be a common line on commuter size transport aircraft, and such a common line should, of necessity, involve all manufacturing countries.

Senator Kassebaum, Congressman Glickman, that concludes my prepared statement. I should be pleased to answer any questions you or members of the Committee may have.

Exports of U.S. Civil Aerospace Products
In Millions of Dollars

	Complete Transport Aircraft	Complete General Aviation Aircraft	Complete Helicopters	Other Complete Aircraft**	Total Complete Aircraft
1974	$2,654 (79%)*	$297 (9%)*	$110 (3%)	$305 (9%)	$3,366
1975	2,397 (75%)	312 (10%)	105 (3%)	398 (12%)	3,203
1976	2,468 (77%)	362 (11%)	113 (4%)	268 (8%)	3,211
1977	1,936 (70%)	398 (14%)	105 (4%)	317 (12%)	2,747
1978	2,558 (71%)	496 (14%)	156 (4%)	415 (12%)	3,625
1979	4,998 (81%)	650 (11%)	207 (3%)	322 (5%)	6,177
1980	6,173 (80%)	739 (10%)	285 (3%)	543 (7%)	7,740

	Turbine Engines	Other Engines	Parts, Accessories, Equipment	Total Civilian Aerospace Exports
1974	$ 195	$34	$1,678	$5,273
1975	186	45	1,890	5,324
1976	213	41	2,212	5,677
1977	196	31	2,069	5,049
1978	231	45	2,116	6,018
1979	323	52	3,220	9,772
1980	468	45	4,325	12,578

* As percent of value of all complete aircraft exports.
** Includes used aircraft.

Role of Exports in Civil Aircraft Sales -- Units

	Number of Civil Aircraft		Number of Commercial Transports	
	Shipped	Exported	Shipped	Exported
1974	15,326	5,598 (37%)*	332	227 (68%)*
1975	15,251	4,372 (29%)	315	181 (57%)
1976	16,445	4,283 (26%)	238	158 (66%)
1977	17,943	4,368 (24%)	185	101 (55%)
1978	18,965	4,399 (23%)	244	111 (45%)
1979	18,492	5,115 (28%)	388	200 (52%)
1980	13,691	4,434 (32%)	415	237 (57%)

	Number of Helicopters		Number of General Aviation Aircraft	
	Shipped	Exported	Shipped	Exported
1974	828	420 (51%)	14,166	4,428 (30%)
1975	864	437 (51%)	14,072	3,512 (25%)
1976	757	356 (47%)	15,450	3,539 (23%)
1977	848	346 (41%)	16,910	3,611 (21%)
1978	904	399 (44%)	17,817	3,612 (20%)
1979	1,019	428 (42%)	17,055	3,995 (23%)
1980	1,272	659 (52%)	11,881	3,559 (30%)

* Exports as percent of shipments.

Role of Exports In Civil Aircraft Sales -- Dollar Value
Dollars in Millions

	All Civil Aircraft		Commercial Transports	
	Shipped	Exported	Shipped	Exported
1974	$ 5,091	$3,366 (66%)*	$3,993	$2,655 (66%)*
1975	5,086	3,203 (63%)	3,779	2,397 (63%)
1976	4,706	3,211 (68%)	3,192	2,468 (77%)
1977	4,691	2,747 (59%)	2,889	1,936 (67%)
1978	6,480	3,625 (56%)	4,332	2,558 (59%)
1979	10,803	6,177 (57%)	8,167	4,998 (61%)
1980	N/A	7,740	N/A	6,173

	Helicopter		General Aviation Aircraft	
	Shipped	Exported	Shipped	Exported
1974	$ 189	$110 (58%)*	$ 909	$297 (33%)*
1975	274	105 (38%)	1,033	312 (30%)
1976	285	113 (40%)	1,229	362 (29%)
1977	251	105 (42%)	1,551	398 (26%)
1978	326	156 (48%)	1,822	496 (27%)
1979	436	207 (47%)	2,200	650 (30%)
1980	N/A	285	2,507	739 (29%)

* Value exported as percent of value shipped.

FROM FORTUNE, AUGUST 24, 1981 (p.84) ANNEX B

THE 50 LEADING EXPORTERS

RANK					FORTUNE 500		EXPORTS AS PERCENT OF SALES	
'80	'79	COMPANY	PRODUCTS	EXPORTS ($000)	SALES ($000)	RANK	%	RANK
1	1	**Boeing** (Seattle)	Aircraft	5,503,800	9,426,200	30	58.39	1
2	●	**General Motors** (Detroit)	Automotive vehicles and parts, locomotives	5,287,100	57,728,500	3	9.16	38
3	2	**General Electric** (Fairfield, Conn.)	Generating equipment, aircraft engines	4,265,000	24,959,000	10	17.09	20
4	●	**Ford Motor** (Dearborn, Mich.)	Automotive vehicles and parts	3,453,000	37,085,500	6	9.31	37
5	3	**Caterpillar Tractor** (Peoria, Ill.)	Construction equipment, engines	3,094,000	8,597,800	33	35.99	3
6	5	**E.I. du Pont de Nemours** (Wilmington, Del.)	Chemicals, fibers, plastics	2,175,000	13,652,000	15	15.93	23
7	6	**United Technologies** (Hartford)	Aircraft engines, helicopters	2,142,593	12,323,994	21	17.39	18
8	4	**McDonnell Douglas** (St. Louis)	Aircraft	2,065,800	6,066,300	53	34.05	4
9	●	**International Business Machines** (Armonk, N.Y.)	Information-handling systems, equipment, and parts	1,615,000	26,213,000	8	6.16	44
10	8	**Lockheed** (Burbank, Calif.)	Aircraft and related support services	1,358,000	5,395,700	61	25.17	8
11	●	**Eastman Kodak** (Rochester, N.Y.)	Photographic equipment and supplies	1,357,029	9,734,303	29	13.94	27
12	12	**Union Carbide** (New York)	Chemicals, plastics	1,240,000	9,994,000	27	12.41	31
13	9	**Westinghouse Electric** (Pittsburgh)	Generating equipment, defense systems	1,192,000	8,514,300	34	14.00	26
14	7	**Weyerhaeuser** (Tacoma, Wash.)	Pulp, logs, lumber, wood products	1,140,000	4,535,814	83	25.13	9
15	10	**Raytheon** (Lexington, Mass.)	Electronic equipment	1,042,000	5,002,088	69	20.83	13
16	25	**Monsanto** (St. Louis)	Herbicides, textile fibers, specialty chemicals	1,026,400	6,573,600	48	15.61	24
17	●	**Dow Chemical** (Midland, Mich.)	Chemicals, plastics, magnesium metal	909,000	10,626,000	25	8.55	39
18	23	**International Harvester** (Chicago)	Construction and farm equipment, trucks	888,000	6,311,804	49	14.07	25
19	●	**Hewlett-Packard** (Palo Alto, Calif.)	Electronic equipment	831,000	3,099,000	120	26.82	6
20	13	**Archer-Daniels-Midland** (Decatur, Ill.)	Soybean meal and oil, wheat, corn	808,941	2,802,011	139	28.87	5
21	14	**Signal Companies** (La Jolla, Calif.)	Trucks, engines, chemicals	803,800	4,285,300	85	18.76	15
22	24	**Dresser Industries** (Dallas)	Oil-field and industrial equipment	703,700	4,016,300	93	17.52	16
23	●	**Ingersoll-Rand** (Woodcliff Lake, N.J.)	Drills, compressors, pumps, bearings, tools	702,600	2,970,960	129	23.65	10
24	16	**Philip Morris** (New York)	Tobacco products	702,400	7,328,300	45	9.58	35
25	20	**Deere** (Moline, Ill.)	Farm equipment	688,000	5,469,625	60	12.58	30
26	●	**Mobil** (New York)	Lubricating oils	683,000	59,510,000	2	1.15	48
27	18	**Kaiser Aluminum & Chemical** (Oakland, Calif.)	Aluminum	676,300	3,222,100	114	20.99	12
28	17	**Occidental Petroleum** (Los Angeles)	Agricultural chemical products, coal	651,000	12,476,125	20	5.22	46
29	19	**Textron** (Providence)	Helicopters, machine tools, metal products	636,000	3,637,500	102	17.48	17
30	11	**Northrop** (Los Angeles)	Aircraft and related support services	614,600	1,655,400	219	37.13	2
31	●	**Exxon** (New York)	Petroleum and chemicals	583,000	103,142,834	1	.57	50
32	●	**Aluminum Co. of America** (Pittsburgh)	Aluminum	588,900	5,147,600	63	11.44	34
33	33	**Celanese** (New York)	Fibers, chemicals	576,000	3,348,000	107	17.20	19
34	22	**FMC** (Chicago)	Industrial and farm equipment	558,517	3,482,183	103	16.04	22
35	15	**Rockwell International** (Pittsburgh)	Electronic, automotive, and industrial equipment	543,000	6,906,500	46	7.86	41
36	21	**R.J. Reynolds Industries** (Winston-Salem, N.C.)	Tobacco products	535,300	8,449,000	35	6.34	43
37	43	**International Minerals & Chemical** (Northbrook, Ill.)	Potash, phosphate, industrial minerals	463,700	1,789,600	201	25.91	7
38	●	**Digital Equipment** (Maynard, Mass.)	Computer systems and equipment	453,814	2,368,045	162	19.16	14
39	●	**Sperry** (New York)	Computer systems and equipment	453,213	4,785,425	77	9.47	36
40	28	**Williams Companies** (Tulsa)	Phosphate products, fertilizer	444,000	2,072,686	181	21.42	11
41	●	**NCR** (Dayton, Ohio)	Mainframe computers and terminal systems	426,621	3,322,370	108	12.84	29
42	28	**American Motors** (Southfield, Mich.)	Automotive vehicles and parts	421,579	2,552,587	155	16.52	21
43	31	**International Paper** (New York)	Pulp and paper products	411,000	5,042,900	67	8.15	40
44	●	**Phillips Petroleum** (Bartlesville, Okla.)	Petrochemicals, natural gas	374,000	13,376,563	16	2.80	47
45	47	**Emerson Electric** (St. Louis)	Electronic components	371,783	3,066,841	124	12.12	33
46	29	**Allied Chemical** (Morristown, N.J.)	Fibers, plastics, chemicals	369,000	5,519,000	59	6.69	42
47	●	**Control Data** (Minneapolis)	Computers and peripheral equipment	361,900	2,765,600	141	13.09	28
48	●	**Minnesota Mining & Manufacturing** (St. Paul)	Industrial, health-care, graphics, electronics products	361,000	6,079,540	52	5.94	45
49	●	**Standard Oil of California** (San Francisco)	Chemicals, fuel and gas oils	359,000	40,479,000	5	.89	49
50	●	**AMAX** (Greenwich, Conn.)	Molybdenum, nickel, and phosphate products	357,330	2,949,170	131	12.12	32
		TOTALS		57,277,720	599,858,168			

● Not on last year's list.

Mr. **Glickman**. Thank you, Dr. Piper.

I referred to you earlier today in reference to the Department of Commerce's role in promoting U.S. exports, and last night we talked a little bit about the lack of significant promotion of aviation in the Department of Commerce. I hope I didn't misquote you. I thought you might want to repeat or amplify on what you told me last night.

Dr. **Piper**. Thank you. I think the comment last evening came in the context that perhaps this industry doesn't hurt enough. It is a successful industry. If one looks at the general statistics, 90 percent, 95 percent perhaps, of general aviation aircraft in the world were manufactured in the United States, and a good many of those, here in Wichita; 80 percent, maybe 82 percent of all commercial transports in operation were manufactured in the United States, so why are we concerned about the industry?

I think there is reason to be concerned because those data are based on the work of the past 20 years, 30 years. If you look at present orders, the U.S. share is nowhere near that. In the transport area, it is split. I am sorry to say, Douglas and Lockheed rank third and fourth in the world in transport sales, no longer second and third.

Mr. **Glickman**. Airbus being second and Boeing being first?

Dr. **Piper**. Yes. Government perhaps sometimes finds itself responding to problem cases, and of the trade people at the Department of Commerce—and that is where I was making the particular observations—a great many, are focused on a number of specific industries. Aircraft represents 10 percent of all U.S. exports of manufactured goods.

I made a comment a moment ago that the Aircraft Agreement needs effective enforcement. There are already a number of people at the Department of Commerce working on aircraft issues, but there is really only one person, of all the people they have in the International Trade Administration, whom you can identify as working full time in aircraft trade matters.

Mr. **Glickman**. For some sort of comparison, how many are working on textiles?

Dr. **Piper**. I don't know. I could ask that they supply an answer.

[The information follows:]

UNITED STATES DEPARTMENT OF COMMERCE
International Trade Administration
Washington, D.C. 20230

OCT 9 1981

Mr. Curt Stanford
Research Assistant, Subcommittee
on Transporation, Aviation
and Materials
Committee on Science and Technology
2321 Rayburn Building
Washington, D.C. 20515

Dear Mr. Stanford:

Mr. Stephen Piper of the Office of the U.S. Trade Representative has asked us to respond to some questions which were raised by Congressman Glickman during the hearings on commuter aircraft issues held in Wichita, Kansas in August.

Mr. Glickman wanted to know the extent of Commerce Department personnel resources which are devoted to the aircraft industry's international trade problems.

Currently, we have one senior industry and trade specialist (Ms. Sally Bath) in the Office of International Sectoral Policy, who coordinates and supervises our program for the effective enforcement of GATT Agreement on Trade in Civil Aircraft. She is also responsible for developing our sector-specific (aerospace) program on international economic policy issues. Sally has as a resource in this effort the time and talent of in the neighborhood of 60 professionals in our Trade Agreements Unit. For example, Sally is supported in both her Aircraft Agreement and aerospace work by a specialist in Trade Agreements who provides information and expertise on Brazilian trade policies affecting her industry constituency.

As a means of comparison, Mr. Glickman asked how many people in ITA work on textile problems. The Department's Office of Textiles and Apparel is charged with the implementation of 23 international bilateral trade agreements, and is currently staffed with 47 individuals, headed by a Deputy Assistant Secretary.

As for steel (also raised by the Congressman), steel is one of the basic industries which is monitored closely by the Office of International Sector Policy, but staffing constraints are such, due to budget pressures, that while one person remains conversant with the problems of the industry, that individual also works with the other basic industries.

In addition to the attention provided the steel industry by the Office of International Sector Policy, another 50 monitor the trigger price mechanism, which pertains to dumping of steel in the U.S. market.

The Department of Commerce takes the view that staffing should not be a numbers game. We must get the job done effectively, but with with no more people involved than are required to handle the work. By bringing in the right caliber of individual, we can keep our staffing lean but effective.

If you have any additional questions concerning our evolving staffing patterns, we will be pleased to discuss our problems and plans with you.

Sincerely,

Marjory Searing

Marjory Searing
Director
Office of International Sector Policy

cc: W.S. Piper, USTR

Mr. **Glickman**. Would it be significantly more than one?

Dr. **Piper**. Yes; there is a Deputy Assistant Secretary of Commerce for Textile Negotiations.

Mr. **Glickman**. How about steel?

Dr. **Piper**. Again, I don't have specific information but it is more than one by a significant——

Mr. **Glickman**. OK. I may ask more questions later, but I will turn it over to Nancy.

Senator **Kassebaum**. You touched on this, Dr. Piper, when you mentioned that those countries that were not signatories to the Aircraft Agreement were largely the countries which we are having a more difficult time with in working out trade arrangements. Do you feel that there are good prospects ahead for the other countries, such as Brazil, to sign the agreement and abide by the Agreement on Trade in Civil Aircraft?

Dr. **Piper**. I must say that when we entered into the negotiation of the Agreement on Trade in Civil Aircraft, we were following the directions of the Congress in the Trade Act of 1974 to identify certain countries which would be deemed to be key signatories and that we would not enter into such an agreement absent the participation by those countries. I would very much like to have Australia, Brazil, Indonesia, and Israel, as signatories in the Agreement on Trade in Civil Aircraft. We did not list them and others as key signatories. We didn't say we will not enter into this agreement unless they do, because we thought that the concessions that we would have had to have made at that time to obtain their signature would have reduced the value of the agreement.

The agreement, I argue, sets an international standard. I never have and won't now argue that it solves all the problems. There are questions that are raised from time to time about the trade practices in the aircraft sector of signatories to the agreement, and we still have those to work with. So that even for signatories it doesn't answer all of the problems, but it does set the standard.

We are talking to a number of governments about signing the agreement. Frankly, we have put more focus though in our discussions with them on some of their specific trade practices. Instead of signing an agreement, we are talking about trade practices that our companies are reporting, here today and previously, to be impairments of their trade efforts. We are talking those specific issues up on a bilateral basis.

Mexico, for example, has taken some trade measures which are not a violation of any bilateral or multilateral agreement. But nonetheless these measures are not consistent with the Agreement on Trade on Civil Aircraft. Mexico is not a signatory, but we will take up with them those questions of import restraints to try to preserve, to the extent possible, access for U.S. manufacturers of general aviation and commuter aircraft to the Mexican market.

Senator **KASSEBAUM**. I personally think that is a very beneficial approach to take.

What sanctions are there in the agreement for those nations that are signatories to it if they are violating the agreement or reluctant to practice it in any way?

Dr. **PIPER**. There are no specific sanctions provided for in the agreement. There is no world court for trade practices. But there is a world forum, and we think it works pretty well. We are hopeful to have a ministerial meeting in Geneva of the GATT next year for the purpose of taking a broader view at how does this international forum on trade work?

There are specific cases that can be raised. There is a standard against which conduct can be measured, and it is through a consensus or collegiality of international opinion that certain countries perhaps can be either persuaded or encouraged to modify certain practices so as to conform them with an international standard.

On the question of export credit subsidies into the U.S. market, we are the world's largest single market for civil aircraft, something like 45 percent of transports, something like 65-66 percent of general aviation aircraft. While there is not specific data for commuters, I estimate between 45 and 55 percent of the world market for commuter-sized aircraft.

We have domestic statutes, and we have provisions of the Subsidies Code—another of the agreements of the Tokyo Round—that can be invoked. In fact we have raised the matter of export credit subsidies in the GATT in the Subsidies Code Committee and in the Aircraft Agreement Committee.

We have some influence on access to and on fair trade practices in our own market. I think there is some prospect that we can evolve effective change to put the competition on an equitable basis.

Senator **KASSEBAUM**. Would you be supportive of a policy that would essentially reflect that if there is no reciprocal agreement, then no certification?

Dr. **PIPER**. I would have to look at that question very carefully. Mr. Segner and I have had an agreement here; in fact we were kidding about it earlier. He will deal with the safety questions in the FAA and I will attempt to deal with some of the trade questions. I think that your question perhaps goes right down the middle between the two of us. I would hate to see anything happen to the integrity of the FAA's technical capability in airworthiness certifications that would raise any doubt about safety as the criterion. That is how I would view it.

Senator **Kassebaum**. Spoken like a true diplomat.

Well, there was a suggestion made this morning that perhaps we could pursue that line of thinking.

Dr. **Piper**. Something that we can pursue, if we come to believe that other governments are interpreting their own airworthiness requirements in a way so as to discriminate against U.S. aircraft, we have some basis for raising that in the GATT in a trade context under the Agreement on Technical Barriers to Trade and also under the Agreement on Trade in Civil Aircraft.

The point of the Agreement on Technical Barriers to Trade [Standards Code] is that we recognize that for reasons of health, safety, environmental concerns, governments do impose regulations on products, either on the operation of products or on the nature of the products themselves. Pharmaceuticals, chemicals, a number of things have regulations. Those are deemed appropriate. But the discipline of the code in a sense is that an imported product should be tested to the same standard as a domestic product. There should not be a different or more difficult standard for the imported product.

If there is a case of different treatment that can be substantiated, then I think that you would find the U.S. Trade Representative willing and desirous of advancing that case in a trade context, because then it isn't a question of safety, it is a question of using a safety regulation or standard as a trade discriminant or barrier, and we would like to see those removed wherever they would be deemed to be found to exist.

Senator **Kassebaum**. Under current law could countervailing duties be imposed if it was found there was unfair trade?

Dr. **Piper**. In my belief, yes.

If there is a subsidy, then our countervailing duty statutes provide that one can impose such a duty if there is a subsidy and injury is proven. There is a process to be followed in order to impose a countervailing duty. It is not simply a matter of asserting that there is a subsidy, then immediately applying the duty.

Senator **Kassebaum**. No; there has to be proof.

Dr. **Piper**. There is a legally provided for process.

Senator **Kassebaum**. But there is a mechanism by which one can do that now?

Dr. **Piper**. Yes, and that is administered by the Department of Commerce.

Senator **Kassebaum**. Thank you very much.

Mr. **Glickman**. Thank you very much.

Dr. **Piper**. Thank you.

Mr. **Glickman**. I think that concludes the testimony today. While I don't think we have touched on every issue affecting aviation, I think that we have pretty amply explored some issues involving trade and technology.

I personally feel that these are among the most productive hearings that I have ever had the opportunity to attend. One of the reasons is because I was able to stay for all of the testimony. You know, often in Washington you are in and out all the time due to rollcall votes and other business. I think that from our standpoint and from the legislative point of view, I learned some things regarding the operations of NASA and the peculiar trade problems our aviation industry faces that will be very useful. I intend to share this information with my colleagues.

I want to say how much I appreciate joining with our Senator from Kansas, whose subcommittee has actually much broader jurisdiction than mine over a variety of issues. I appreciate the opportunity of having a joint hearing.

Senator KASSEBAUM. You can concentrate on the technology.

I would join with those comments. I think that it is interesting that both Congressman Glickman and myself, at this point in time, are chairing two important Aviation Subcommittees. I know it is of particular interest to us, and I hope that it will be of benefit to the State and to the industry. But I know that it makes this work a particular pleasure.

I, too, feel that the hearing today has been very beneficial and would like to also, as you said earlier this morning, Dan, express my appreciation to the staff, who have been very helpful in putting this hearing on.

Mr. GLICKMAN. The hearing is adjourned.

[Whereupon, at 3:45 p.m., the subcommittee was adjourned, subject to the call of the Chair.]

THE INSTITUTE OF
ELECTRICAL AND
ELECTRONICS
ENGINEERS, INC.

26 August 1981

PLEASE REPLY TO:
Professional Activities
Task Force on Aviation
Wichita Section, IEEE

Congressman Dan Glickman, Chairperson
House Science and Technology Subcommittee
on Transportation, Aviation, and Materials

Dear Congressman:

The Wichita Section of the Institute of Electrical and Electronics Engineers wishes to express its interests and concerns in the promotion of General Aviation in the State of Kansas.

The manufacture of civil aircraft, component parts, and avionics constitutes one of the principal industries of this state. This industry is one of the main sources of employment for engineers in the state. As such, it provides one of the State's major opportunities for employment of young engineers graduating from our Colleges and Universities. For each engineer employed, the industry also employs several workers of various levels of skill. In short, the overall health of the state economy benefits. The local Wichita General Aviation Community employs approximately 22,500 persons of whom about 1,000 are engineers of various disciplines and approximately 110 of these are electrical engineers.

According to information provided by the Aircraft Owners and Pilots Association: "General aviation is all civil flying except that of the certificated scheduled airlines. General aviation is 96% of the pilots flying 99% of the civil aircraft, 84% of the total hours, over 61% of the aircraft miles transporting intercity one-third of the people who travel by air and conducting business, industrial and agricultural services". Consequently, we believe that General Aviation, in addition to providing employment for our professional colleagues, greatly enhances the overall economy of both the State and The Nation.

Very truly yours,

James R. McDougal

James R. McDougal
Vice Chairman
Wichita Section, IEEE
Box 135
South Haven, KS 67140-0135

FAIRCHILD
SWEARINGEN CORPORATION
P.O. Box 32486 • San Antonio, Texas 78284 • (512) 824-9421

August 19, 1981

The Honorable Dan Glickman, Chairman
House Science & Technology Subcommittee
on Transportation, Aviation, and
Materials
U. S. House of Representatives
Suite 2321 Rayburn House Office Building
Washington, D. C. 20515

Dear Mr. Glickman:

In reply to your letter of July 28, 1981, concerning the hearings in Wichita on August 27, I am pleased to have the opportunity of commenting on several issues of grave concern to Fairchild Swearingen.

Our business is designing, testing and manufacturing transport aircraft for the commuter airline industry and executive aircraft for corporations, and marketing these worldwide. We produce the 19-passenger turboprop Metro commuter transport and two executive aircraft designated Merlin III and Merlin IV. We have recently undertaken a several hundred million dollar venture in conjunction with SAAB Scania Company of Sweden to design, produce and market a new 34-passenger commuter airliner. An executive version is also planned. We are the only U.S. company to undertake such a venture in competition with DeHavilland of Canada, Embraer of Brazil, CASA of Spain, and perhaps other competitors.

In the last 18 months our business has received a serious reversal in sales to the U.S. commuter airline market. In this period we have lost a large share of the market to foreign competition, primarily Embraer of Brazil. This is illustrated in enclosure "A".

The reason for this reversal has been U.S. short term interest rates of over 20%, combined with foreign competitors offering interest rates as low as 7½%.

Even before this period of high U.S. interest the Brazilian National Aircraft Industry, Embraer, had been penetrating our market with predatory financing far better than the financing obtainable from U.S. sources. Their financing included 85-100% financing with interest rates of 7½-8½% for 8-10 years. An analysis of some of Embraer's earlier sales is presented in enclosure "B" with this letter.

The aircraft which Embraer offers is the Bandeirante - an 18-passenger, unpressurized, twin turboprop in direct competition to our Metro aircraft. The certification of this was, as we understand it, accomplished by the FAA at the direction of our State Department. The reason being given for State Department involvement was that Brazil was one of the two countries

TELEX: 76-7315 TWX: 910-871-1296 CABLE: MERLIN

with which the U.S. had a favorable balance of trade. This aircraft was certificated under Special Aviation Regulation 23, long after the legal expiration date of this regulation.

In addition to this threat to our business in the U.S. commuter market, the Brazilian Government has banned the sale in Brazil of U.S. aircraft competitive to those produced by Embraer, including our Metro and Merlin aircraft.

Also, Embraer has undertaken development of a 30-passenger commuter airliner in direct competition to our 34-passenger commuter and have indicated to potential U.S. customers that the same predatory financing will be offered.

DeHavilland of Canada has also felt the effects of predatory financing, as indicated in enclosure "C", and is prepared to develop a competitive program supported by the Canadian Government, which has previously recognized the problem in other areas (see enclosure "D").

Approximately a year ago we made a telephone survey of ten U.S. commuter airlines who bought competitive foreign aircraft to determine if financing was a critical factor. All admitted that financing influenced their decision and five stated that it was a critical factor. The results of the survey are shown in enclosure "E".

Our position is that the U.S. aviation industry, ourselves included, welcomes head-to-head fair competition with the aviation industry of any country. However, the industry cannot develop and prosper in competition with predatory financing by foreign industry which is supported by foreign governments. Our own Government allows investment tax credit and U.S. Government guaranteed loans to purchasers and pays essential service subsidies to operators of foreign equipment.

I appreciate the opportunity to offer the above comments in behalf of Fairchild Swearingen Corporation.

Sincerely,

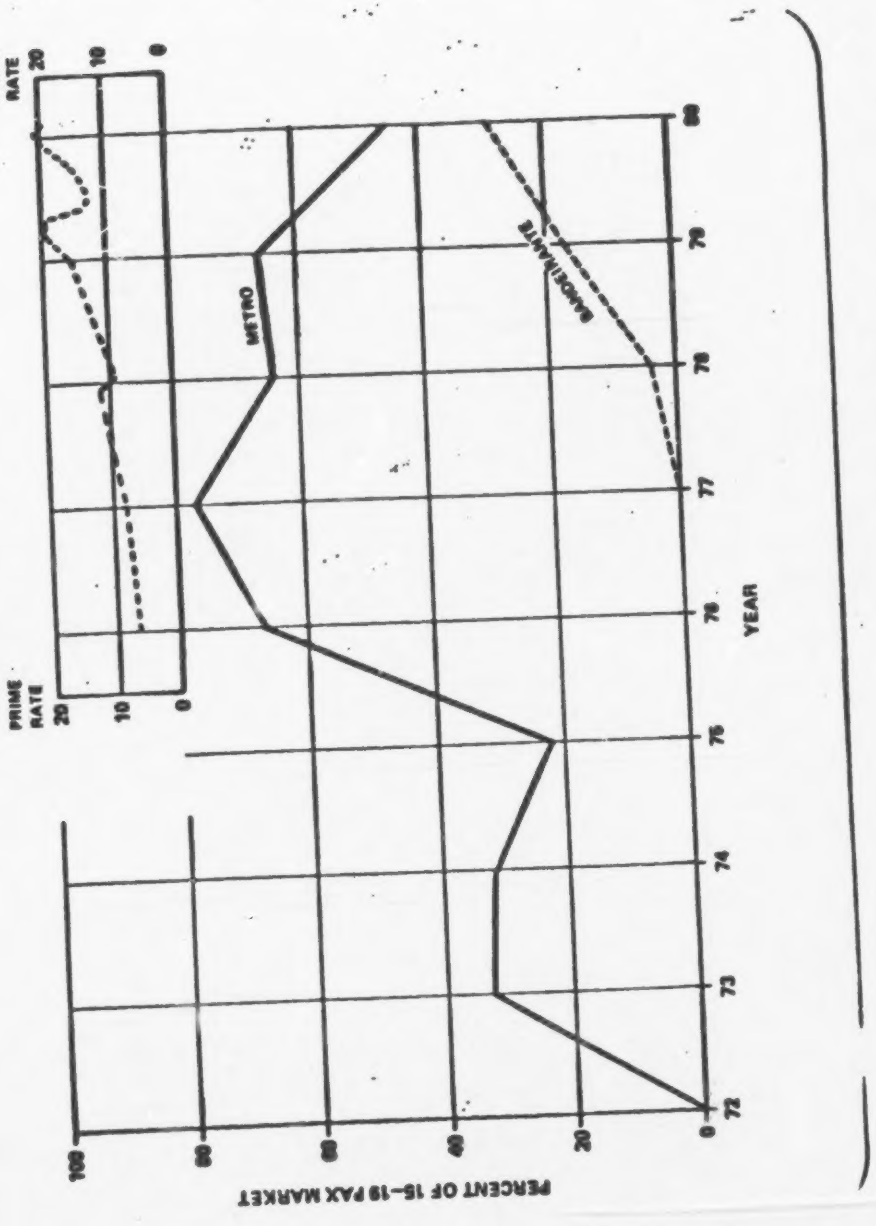
FAIRCHILD SWEARINGEN CORPORATION

W. Daniel Heidt

W. Daniel Heidt, President

EM/WDH/jlg
Enclosures

Enclosure "A"



MARKET SHARE

Visual Products Division 3M

BANDEIRANTE EMB-110 SALES ANALYSIS

PRIMARY TRANSACTION

REGISTRATION # N	SERIAL NUMBER	OWNER OF RECORD	PREVIOUS OWNER	TYPE OF SALE	MFG. LIEN	FIN SOURCE LESSOR OR 1ST LIEN HOLDER	YEAR OF SALE	TENURE OF FINANCING OR LEASE	DOWN PAYMENT	INTEREST RATE
101RA	110220 P-1	Woodhaven LSG	McNamee A/C Sales	B/S	1,000,000.00	Bank of AM	1979	F 10 years		
101RJ	110063 P-1	R. Terry	Embraer	B/S	1,540,876.47	Bank S. Paulo	1979	F		
102RJ	110.202 P-1	R. Terry	Embraer	B/S	1,540,876.47	Bank S. Paulo	1979	F		
108CA	110.241 P-1	M.G.B.	Schapp-Terry	C.S.A.	* 909,071.00	Embraer	1979	F 10 Years		
110TN	110.271 P-1	Tenn. AW	Schapp-Terry	S/A	* 960,016.00	Embraer	1979	F 8 Years		8.5% PA
[illegible]	110.229 P-2	I.T.T.	Embraer	B/S	---	I.T.T.	1979	---		—
107CA	110.239 P-1	Kipper Emp.	Schapp-Terry	C.S.C.	1,210,000.00	Kipper	1979	F	10% 101,000.00	10%
[illegible]	110.210 P-1	Woodhaven LSG	Embraer	S/A	1,000,000.00	Bank of AM	1979	F		—
[illegible]	110.232 P-1	Island AV-Guam	Embraer	S/A	1,388,657.00	Embraer	1979	F	105,000.61	1,110,656 @ 8.5%
[illegible]	110.238 P-1	Island AV	Embraer	S/A	1,041,300.00	Embraer	1980	F 7 Years		8.5% UNPD BAL
[illegible]	110.208 P-1	C.Hammon DE Fn.	Embraer	S/A	* 985,714.00	Embraer	1979	F 8 Years		7.5% PA
301A	110.249 P-1	Imperial AL	Embraer	S/A	1,108,840.00	Embraer	1980	F 10 Years		8.5% PA
401A	110.243 P-1	Almond LSG	Schapp-Terry	C.S.C.	1,308,008.00	Schapp-Terry	1980	F		11% PA
[illegible]	110.198 P-1	J. R. & Terry	Embraer	S/A	1,540,876.00	Bank-S. Paulo	1979	F		—
[illegible]	110.204 P-1	J. Schapp	Embraer	S/A	* 887,714.00	Embraer	1979	F 7 Years		7.5% UNPD BAL
[illegible]	110.205 P-1	J. Schapp	Embraer	S/A	1,048,750.00	Embraer	1979	F 8 Years		8.5% UNPD BAL
614KC	110.224 P-2	Aero-Mech.	Embraer	S/A	1,038,173.00	Embraer	1979	F 10 Years	300,000.00	8.5% ANN INT
615KC	110.230 P-1	Aero-Mech	Embraer	S/A	1,056,026.00	Embraer	1979	F 10 Years		8.5% ANN INT
616KC	110.228 P-1	Aero-Mech	Embraer	S/A	1,019,831.00	Embraer	1979	F 10 Years		8.5% ANN INT
617KC	110.251 P-1	Aero-Mech.	Embraer	S/A	1,019,831.00	Embraer	1980	F 10 Years		8.5% ANN INT
618KC	110.256 P-1	Aero-Mech.	Embraer	S/A	1,019,831.00	Embraer	1980	F 10 Years		8.5% ANN. INT.
601RA	110.237 P-1	Royale AL	Embraer	S/A	1,039,161.00	Embraer	1979	F 8 Years		8.5% UNPD BAL
602RA	110.240 P-1	Royale AL	Embraer	S/A	* 923,911.00	Embraer	1979	F 8 Years		8.5% UNPD BAL
603RA	110.275 P-1	Soundview LSG	Royal Air Lines	S/A	1,072,121.00	Embraer	1980	F 8 Years		8.5% UNPD BAL
604RA	110.260 P-1	Royale AL	Embraer	S/A	1,008,046.00	Embraer	1980	F 8 Years		8.5% UNPD BAL
710NH	110.299 P-1	Ldr. One Assoc.	Schapp-Terry	C.S.C.	1,304,000.00	Embraer	1980	F 10 Years		10.335% UNPD BAL
711NH	110.216 P-1	New Haven AW	Embraer	S/A	1,093,776.00	Embraer	1979	F		
[illegible]	110.273 P-1	Prov'TN Boston AL	Embraer	S/A	1,279,144.00	Embraer	1980	F		
[illegible]	110.259 P-1	Prov'TN Boston AL	Schapp-Terry	S/A	1,286,426.00	Embraer	1980	F		
[illegible]	110.265 P-1	Prov'TN Boston AL	Schapp-Terry	S/A	1,296,426.00	Embraer	1980	F		

8 SALES BY U.S. CO.
22 EMBRAER

*DOWN PAYMENT REDUCED LIEN

8 BY U.S. CO'S
25 BY BRAZIL

RANGE 7 TO 10 YRS.

AVG. 8.5%

SECONDARY TRANSACTION

END BUYER OR LESSEE	TYPE OF SALE	YR OF SALE OR LEASE	LESSOR OR FINANCER	SALE PRICE OR LIEN AMT.	PAYMENT SCHEDULE	SECURITY DEPOSIT	TENURE OF LEASE OR PAY-OUT	INT RATE	NOTES
Wyoming AL	Lease	1979	L. Bank S.Paulo		16,750 PM +20.00/hr	50,000.00			
Wyoming AL	Lease	1979	L. Bank S.Paulo		16,750 PM +20.00/hr	50,000.00			
Cascade AW	Lease	1979	L. Embraer	1,304,000.00	36 m @ 16,750 83m @ 17,000		L 10 years	10%	
Tenn. AW	Lease	1980	F. Embraer	1,235,702.00			F 9 years	10%	
MidSouth AL	Lease	1980	L. I.T.T.		16,620.41 PM	*25,325.00	L 10 years		
Cascade AW	Lease	1979	L. Kipper		36m @ 16,300 23 m @ 16,500		L 59 months		
NOTE: FAA file shows pending record of sale back to Bandeirante Partner #1 Ltd. Carlsbad Ca. 4-15-80									
Imperial AL	Lease	1980	L. Almond Lease	1,447,000	40-1/45 60,090		10 years		Lien Asgd. To Terry
Mtn. West AL	Lease	1979	J.R. & Terry		16,750 p/m +20.00 p/h	50,000.00			Asgd. To Bnk S-Paulo
Mtn. West AL	Lease	1979	J. Schapp		17,000 p/m +20.00 p/h	50,000.00	7 years		Asgd To Embraer
Mtn. West AL	Lease	1979	J. Schapp		17,400 p/m +20.00 p/h	50,000.00			Asgd. To Embraer
NewHaven AW	Lease	1980	Leader One Assoc.		Anly 180,000 Mthly 15,000		7 years		
2ND Morg.	$351,821@13%		1st Bnk.New Hav.						
				1,304,000			9 years	10%	
			Embraer	1,304,000			9 years	10%	
OR	Sale	1980	Embraer	1,304,000					

AVERAGE MONTHLY RANGE $16,000.00 TO $17,000.00

RANGE 5 TO 10 YRS.

[illegible]:
B/S: BILL OF SALE
S/D: SECURITY DEPOSIT
C.S.A.: CONDITIONAL SALES AGREEMENT
S/A: SALES AGREEMENT
C.S.C.: CONDITIONAL SALES CONTRACT
LSG: LEASING
AW: AIRWAYS
AL: AIRLINES
AV: AVIATION

Enclosure "B"

Enclosure "C"

DE HAVILLAND BLAMES PREDATORY FINANCING FOR LAYOFFS – De Havilland Aircraft of Canada laid off 214 production workers on its Twin Otter assembly line last week and blamed the action on reduced business because of "predatory" financing by foreign competitors. The company said Twin Otter production has been reduced from six units to three units per month, adding that 23 Twin Otter sales were lost in the past 12 months primarily due to "predatory" financing by manufacturers in Brazil, Spain and Australia. De Havilland said the unnamed Brazilian manufacturer has been offering 9.5 percent financing over an eight-year term while the de Havilland financing package is at 12.5 percent interest over five to six years. A number of U.S. aircraft manufacturers have leveled charges about predatory financing by foreign manufacturers – particularly Brazilian manufacturer Embraer – but last week's statement by de Havilland is believed to be the first public complaint on the issue by a Canadian manufacturer. De Havilland officials said they will meet with representatives of the government's Department of Industry, Trade and Commerce and Export Development Corp. in an attempt to develop a competitive plan.

BEECH DELIVERS FIRST OF NEW MODEL 99 AIRCRAFT – Beech Aircraft initiated deliveries last month of the first of its new C99 commuter aircraft *(BA, July 13/12)*. First aircraft went to Christman Air Systems, Washington, Pa. and Sunbird Airlines, Charlotte, N.C. Sunbird has orders and options for 10 of the $1.3 million, 15-passenger aircraft. Beech has orders for more than 30 C99s and production rate is expected to be between 2.5 and three aircraft per month. The new C99 is similar to the Model 99 built between 1968 and 1975, but it does include a number of changes including more powerful Pratt & Whitney PT6A-36 engines, bleed-air heat and hydraulic landing gear. New 99s will continue the serial number series used on the initial 99s. First production unit of the new model, S/N U-165, is being used as a demonstrator by Beech but is eventually destined for operation by Trans Western Airlines of Logan, Utah.

FEE SCHEDULE PROPOSED BY FAA FOR PROVIDING SERVICES OUTSIDE U.S. – Federal Aviation Administration, which recently dropped a three-year effort to impose a series of fees on U.S. pilots for services the agency provides *(BA, July 6/1)*, last week proposed a similar series of fees for the issuance of certain airman and repair station certificates to foreign nationals residing outside the U.S. The proposal suggests fees ranging from as low as $8.00 for issuance of a medical certificate to $508 for each practical test administered by FAA.

The NPRM notes that Congress repeatedly blocked FAA's attempts to collect such fees from U.S. airmen, but cites a section of the International Air Transportation Competition Act of 1979 that gives FAA authority "to establish fee schedules for airman and repair station certificates issued outside the U.S." In addition to helping offset the costs of issuing such certificates to persons outside the U.S., the NPRM states that it is designed "to improve substantially the FAA's surveillance over foreign nationals holding FAA certificates by generally limiting their issuance. The proposed requirement is that certificates be issued overseas to foreign nationals only when needed to operate or maintain aircraft of U.S. registry . . ."

Comments on the proposal must be submitted by Oct. 12, 1981. Copies of the NPRM may be obtained by writing to FAA, Office of Public Affairs, Attn: Public Information Center, APA-430, 800 Independence Ave., S.W., Washington, D.C. 20591 or by calling (202) 426-8058. Requests for copies of the NPRM should refer to Docket No. 22052. Comments on the proposal should be sent to: FAA, Office of the Chief Counsel, Attn: Rules Docket (AGS-204), Docket No. 22052, 800 Independence Ave., S.W., Washington, D.C. 20591.

HUGHES APPOINTS THREE NEW VICE PRESIDENTS – Hughes Helicopters, Culver City, Calif. has appointed three new vice presidents to the firm. William Murphy, who has been with United Technologies for the past 22 years and most recently served as vice president-finance for UT's Norden Systems United Space Boosters and Chemical Systems Division, was named senior vice president and chief financial officer for Hughes. Named as the new vice president-Advanced Attack Helicopter program is Norman B. Hirsh, previously an AAH program manager. He will be responsible for management of the development and production programs. William P. Brown, who has been with Hughes since 1980 as chief engineer for the AAH program, was named vice president-engineering.

Enclosure "D".

WSJ 1-5-80

Canada to Begin Export Financing At Special Rates

By a Wall Street Journal Staff Reporter

OTTAWA – The Canadian government joined the international battle on export credit terms with an announcement that it will provide as much as $900 million (Canadian) over a three-year period in special low-rate export financing.

Canada said its adoption of "credit mixte" financing is in retaliation for the use of such heavily subsidized loans by other exporting nations, principally France and Japan.

Credit mixte is a combination of conventional government export financing and concessionary loans that are made interest free or at very low rates.

Concessionary financing is generally accorded only to the world's poorest nations under recognized aid packages. But under the concept of credit mixte, such interest-free loans are mixed with conventional export loans and the package is extended to wealthier developing nations such as Mexico or Venezuela.

An attempt by industrial nations to forestall the use of such favorable financing fell apart last month, when 22 countries of the Organization of Economically Developed Countries failed to amend an existing "consensus on credits."

Canada said its adoption of the low-rate financing is in the absence of an agreement barring its use. Canada is forced to offer such terms, government officials argued, to compete with other nations. Canada, with the U.S., supported amendments to the consensus on credits that would have limited low-interest rate loans.

Following the negotiations' failure last month, officials said the U.S. would depart from existing policy and extend to 15 or 20 years the terms of some new export loans. Such loans are generally made for shorter periods.

Canada, instead, is proposing lower rates. Interest rates on credit mixte loans might run between 4% and 6%, Canadian officials said. As well, Canada's program will add some $300 million a year to the $1 billion to $1.5 billion average of new loans written yearly by the government's Export Development Corp.

Credit mixte will be available only in those cases where competing nations have offered it, Canadian officials said. Such financing will have to be approved case by case by the Canadian cabinet.

The announcement of Canada's moves brought quick praise from bankers. "It's a very positive step," said Geoffrey Styles, executive vice president of the Royal Bank of Canada's world trade and merchant banking operations. Mr. Styles and others argue that Canadian government financing hasn't been competitive with other nations' export financing programs.

Critics of the subsidized loan programs generally charge that the financings distort free market competition between industrialized nations.

Enclosure "E"

SALES LOST DUE TO FINANCING

COMMUTER AIRLINE	EQUIPMENT PURCHASED	CRITICAL FINANCING
1) Air Miami	CASA 212	
2) Air Nebraska	Bandeirante (1)	Yes
3) Cascade	Bandeirante (3)	Yes
4) Comair	Bandeirante	
5) Fischer Bros. (Galion)	CASA 212 (3)	Yes
6) Mid-South Commuter	Bandeirante	
7) New Air (New Haven)	Bandeirante	
8) Royale	Bandeirante	Yes
9) Silver State Airlines	Bandeirante	
10) Tennessee Airways	Bandeirante (3)	Yes

Testimony before the

Senate Commerce, Science and Transportation
Subcommittee on Aviation

and

House Science and Technology
Subcommittee on Transportation, Aviation and Materials

August 27, 1981
Wichita, Kansas

by

Robert J. Thomas

Director

Michigan Aeronautics Commission

Attention to the distress in aviation in the United States by way of this joint subcommittee is commendable. Those who are motivated to lend their talents in this effort, however, should realize that there will be no quick, easy fixes. Aviation in the United States is in trouble, serious trouble. The latest debacle, the air traffic control situation, is but a fraction of the problem. I will avoid a dreary recitation of facts, data, figures and statistics. It is all too apparent to us all through multiple means of communications that enormous difficulties beset us.

For example, commuter aircraft. No effort by the Congress in the past twenty years matched that of the Airline Deregulation Act of 1978. Yet, its success or failure was dependent upon the existence of the right commuter aircraft being available in quantity. Despite reports to the contrary by those who have either economic or political gain at stake, the right aircraft do not exist in quantity nor are they likely to be much before another three years are past.

What is the right commuter aircraft? There are four (4) criteria they should meet:

1. Fuel efficient; e.g., the right engine/airframe combination for mission profile.
2. Pressurized for weather avoidance, passenger health and public acceptance. Weather avoidance, quite simply, is the ability to contend with in-flight icing conditions and other severe phenomena. Popping the eardrums of passengers in unpressurized equipment is not condusive to their health nor are they likely to gracefully accept a retreat from pressurized jet aircraft to piston engine airplanes that are obviously inferior in comfort. I regret having to dwell on this point, but it is an imperative often overlooked or lightly dismissed. Certainly, the CAB in its drive to reduce subsidy levels, gave it little importance.

3. Sized to markets. Our analysis concluded that profitability and good service by commuter airlines in Michigan would be obtained by 45-50 seat aircraft in most cases with some 15-20 seat aircraft in a fewer number of markets.

4. Domestically manufactured. The vital need to perform reliably has been made very visible during the post-PATCO action of August 4. The air carrier industry is about to accept many disadvantaged positions for the next eight months just to achieve a reliable schedule. The commuter airlines must do even better particularly where they are replacement carriers. Therefor, the aircraft they employ must be well maintained, have short logistic pipelines and immediately available technical assistance. Offshore procurements pose an additional potential problem to their long lines of communication; interruptions due to political circumstances. The United States is quite unlike other nations that are now supplying commuter-type aircraft. These other nations have deeper and more thorough-going government-industry arrangements.

There are only two (2) existing aircraft that meet these criteria and only (1) new design not yet in production.

The foregoing was a necessary preamble to providing the committee answers to the questions posed to me by the July 28, 1981 letter.

Question #1. How can the Government assist traditional private enterprise efforts in aviation, without assuming their role or diminishing healthy and competitive activities?

Answer. The current national level of fiscal disengagement from as many areas as is politically feasible under the banner of defederalization and deregulation is too broadly applied or understood. While less spending is imperative, healthy economic activity is obtainable without total lassez-faire. Government that encourages cooperative venture withoutthe threat of anti-trust action; e.g., approval of consortiums, can be an effective non-spending method of assistance. The usefulness of strict anti-trust enforcement has been overtaken by the real world. It is time to recognize this and promote a world-wide competitive position by statutory amendment.

The question infers that "traditional private enterprise" and "healthy and competitive activities" is a laudable condition and we all understand the meaning attendant. I am not sure I know what the terms refer to in today's business context. I am certain that a cooperative rather than an adversary relationship is requisite to further aviation's position.

Question #2. What is the current true state of our aeronautical capabilites, as compared to foreign competitors?

Answer. Currently we have two weaknesses in our aeronautical capabilities, facilities and talented engineers to produce advance design aircraft; e.g., short haul rugged STOL aircraft. New depreciation allowances may assist the first but any higher demand for defense associated aeronautical engineering will deplete the already thin ranks of engineers.

Certainly the present variances between interest rates hinders marketing, however, I categorize this as outside the area of capability.

Question #3. What are our assets and liabilities with regard to basic aeronautical research and development capabilities and international trade policy?

Answer. This is the largest question and is anwered in four parts.

A. Our greatest asset is our "free thinkers", the innovators, the imaginative. They are currently smothered by corporate or government bureaucracy and are hindered by a demand that efforts be tangible within a short time; have a payoff. Material ruination awaits today's adventurer. These people need to be identified, supported and nourished.

B. Our greatest liability, which is both of an insidious and pervasive one, is our penchant for turf-guarding and "business-as-usual".

C. The largest asset we have for international trade is our incomparable capacity for quantity and scope.

D. The biggest liability is non-recognition of the value of our results. We give away these products by making it almost mandatory to publish.

Question #4. Specifically, in which areas or programs should Government sponsored aeronautical research and development be emphasized?

Answer. My list is aimed at areas rather than definitive items and is perhaps shorter than it could be, however, I believe that we must set goals and thereafter allow some latitude.

A. Lighter empty weight to maximum thrust.
Example; graphite composites, fiber potics, etc.

B. Lower wing loading in high aspect ratio airplanes.
Example; vectored thrust, augmented wing, etc.

C. Higher efficiency power plants.
Example; turbocharging, internal designs of lubricating systems, etc.

D. Application and production techniques for earlier use of R&D.
Example; inertial navigation for civil aircraft, etc.

E. Interchangeable automobile internal combustion engine and aircraft reciprocating engine fuel.
Example; an 80-90 octane range fuel that works as well in both.

F. Automated aircraft control through data link for use over entire flight profile in several high performance aircraft corridors.
Example; classified systems used by the military.

G. Lighter than air vehicles capable of movement of bulk products.
Example; pick up and delivery along abandoned or non-profitable rail freight lines of agricultural produce, and other high bulk materials.

H. Contributions to V/STOL, STOL and VTOL of all sorts.

Question #5. Specifically, what actions should the Government take to enhance the private sector's ability to compete effectively in the world aviation market?

Answer. A. Amend anti-trust laws to reduce liability.

B. Sanction consortiums.

C. Allow tax credit for in-house research and development that supports a national agenda.

D. Establish that a domestic share of production, as a national interest, will attend imports.

E. Support Import-Export Bank.

F. Provide tax-free designation for those parts or portions of productive manufacturing facilities used for the exports (loosely, broaden free trade zone).

G. Establish a national aviation policy. Here I refer to Clifton F. Von Konn's eloquent "Keeping the U.S. First in Air and Space" and the forthcoming AEROSPACE I at Williamsburg, Virginia, August 30 - September 1, 1981.

In closing, please accept my sincerest well wishes in your endeavor. I hope it will be our endeavor, one that aviation in all its forms, organizations and names can find a worthy national goal and, putting aside parochial views, bend on every effort to successfuly achieve a vibrant industry.

Thank you for this opportunity.